ASIC 2016

Fifteenth Annual Summer Interdisciplinary Conference
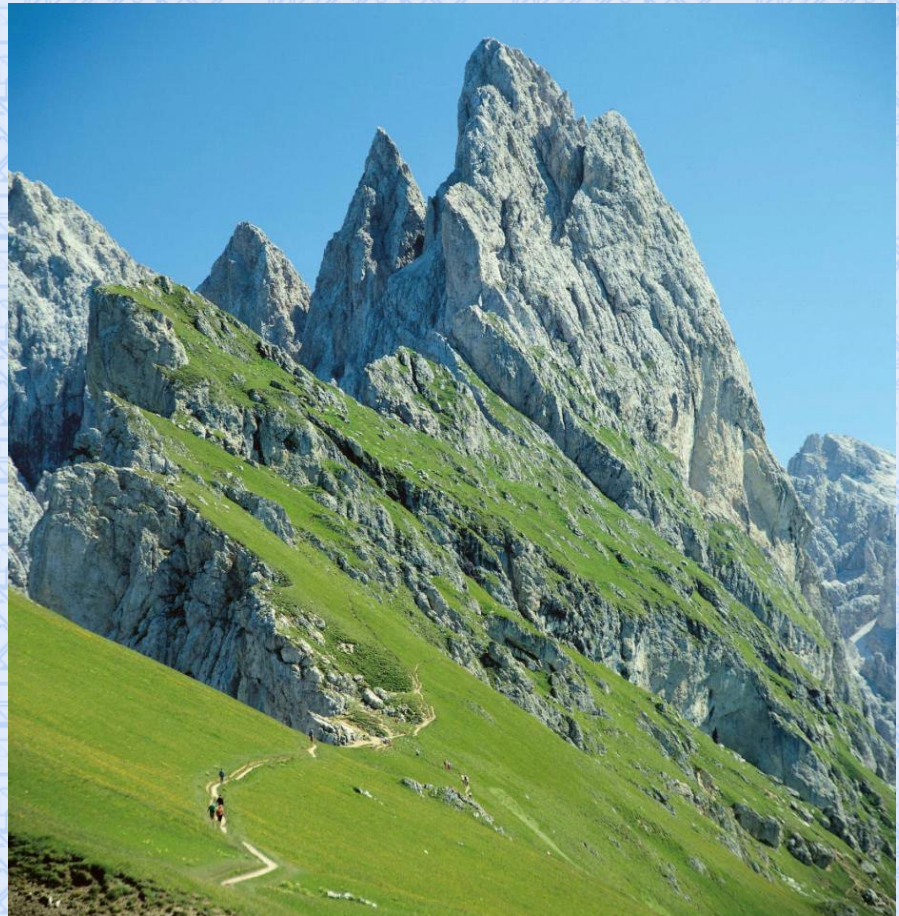
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NEW -- Send in your **registration** and **abstract submission form.**

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Hotel Oswald
Selva, Val Gardena
Italian Dolomites
July 3, Sunday - July 8, Friday

Announcing ASIC 2016

The Fifteenth Annual Summer Interdisciplinary Conference (ASIC 2016) will be held at Hotel Oswald in Selva, Val Gardena, Italy, July 3-8, 2016. The dates are chosen so as to reduce conflicts with the 2016 annual meetings of the Cognitive Science Society and the Mathematical Psychology Society that will take place in Philadelphia later in the summer.

Hotel Oswald is a highly rated hotel with an excellent restaurant (see http://www.hoteloswald.com/en/ --see Lodging on this site).

The meetings and catered breaks will be held in a city conference room adjacent to the hotel, and lodging and dining will be at Hotel Oswald.

Possibly the most highly rated previous ASIC conference was held in 2013 in the adjacent valley to the east, in Cortina d'Ampezzo, and this year's site was chosen in an attempt to replicate that experience without repeating a prior site. The entire area is outstanding in every respect and has been a Unesco World Natural Heritage site since 2009.

Travel to the Selva site is fairly easy, from major airports at Venice, Milan, and Innsbruck, among others, and from those by rental car or bus (see Travel on this site).

Selva is surrounded by Dolomite mountain groups, many with lifts that operate in the summer and bring visitors high in the mountains to hiking trails, biking trials, climbing areas, rifugios, and via ferrata. The area offers activities too many to list here (but see the link 'Activities').

Richard M. Shiffrin of Indiana University - Bloomington is the organizer: Email correspondence should be directed to University   or mailed to Richard M. Shiffrin at Indiana University -- select 'Contact' from the menu for the address.

ASIC Organizer, Rich Shiffrin, atop Torre Grande, near Cortina

The subject matter of the ASIC conferences is interdisciplinary, within the broad frame of Cognitive Science. ASIC uses the very successful format of previous ASIC and AIC conferences: Days are free for leisure activities and discussions among participants. The talks are in the later afternoon/early evening, followed by dinner. The date has been chosen to make it convenient for attendees to bring family/friends.

Previous Years' Websites

Several parts of this year's website are still under construction. For examples of previous years' websites visit ASIC 2015, ASIC 2014, ASIC 2013, ASIC 2012, ASIC 2011, ASIC 2010, ASIC 2009, ASIC 2008, ASIC 2007, ASIC 2006 and ASIC 2005.

Invitation

The conference is open to all interested parties, and their family and friends. An invitation is NOT needed to attend. However, due to the small number of spots for speakers, the organizer will select the attendees to give talks, and choose the lengths of talks. It will be of particular interest to scholars who fit the very general theme of the conference. We encourage you to send the conference information to friends and colleagues.

Conference Aims

The conference will cover a wide range of subjects in cognitive science, including:

- modeling of cognition

- neuroscience, cognitive neuroscience
- psychology (including perception, psychophysics, attention, information processing, memory and cognition)
- computer science and artificial intelligence
- machine intelligence and learning
- methodology and statistics
- linguistics, psycholinguistics and computational linguistics
- philosophy of mind, cognitive science

We especially invite talks emphasizing theory, mathematical modeling, and computational modeling (including neural networks and artificial intelligence). Nonetheless, we require talks that are comprehensible and interesting to a wide scientific audience. Speakers will provide overviews of current research areas, as well as of their own recent progress.

Conference Format

There is a single speaking session each day, intentionally organized to maximize the dissimilarity of each day's presentations. If the number of participants exceeds the number of speaking slots (about 42), then the organizer will select some talks to be of shorter duration, and if necessary choose the speakers that will have the opportunity to present their work. Information on submitting proposals for presentation is on the page of this website labeled "Talk Submissions". Please submit talk information on the website, even if you have already sent (some of) this information to the organizer.

The conference will start with registration and a reception with wine beer, drinks and food from about 15:30-16:15 on Sunday, July 3. On subsequent days there will be drinks and light snacks from ~15:45 - 16:15, followed by a session of about seven spoken presentations that include a mid-session drink break. The last evening of talks will be Friday, July 8, so plan to depart no earlier than Saturday, July 9.

It will not escape the careful reader that this conference format frees most of the day for either discussions with colleagues or various other activities with colleagues, family, and friends. We hope and expect all scientific attendees and participants to attend all sessions. The time frame will allow day trips to nearby sites, but arrange to return in time for the sessions. Travel to sites and planned activities from which a return for the session will not be possible by 16:00 should be arranged for days preceding or following the conference.

Registration

You are not officially on the request list for presenting research until you register and send the registration fee. Visit the Registration page at this website.

Lodging

A block of rooms are presently being held, but are limited (at the price negotiated), and unreserved rooms will gradually be returned to the general public, so reserve soon. For information visit the Lodging page at this website.

Some possibly useful websites:

- http://www.hoteloswald.com/en/
- http://www.valgardena.it/en/
- http://www.val-gardena.com/en/
- https://en.wikipedia.org/wiki/Val_Gardena

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Registration Information for ASIC 2016

If you are planning to attend ASIC 2016, please fill out the registration form and submit your registration fee. This fee pays for rental of the conference room, conference equipment rentals, catering costs for snacks and drinks at conference breaks and receptions, and several other miscellaneous costs.

This year's fee schedule, in US dollars:

	To Indiana Conference Bureau
Prior to January 1, 2016	$275
January 1, 2016 - March 1, 2016	$325
After March. 1, 2016	$375

In addition to the registration fee per person, you may purchase additional guest vouchers for other persons attending the receptions and breaks ($20 per day).

Registration and payments are made via the Indiana University Conference Bureau as indicated on the registration form.

If a registration payment is made, but the attendee cancels prior to June 1 the registration fee will be refunded minus a $25 handling fee. After June 1 and prior to the conference, a refund will still be made, but the handling fee will rise to $75.

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Submissions of Talks and Posters

Whether or not you have already sent some of this information to the organizer by email, please provide on the link below a list of authors (with the presenter indicated), their affiliations, and emails; a title, and an abstract (limit 250 words). These may be changed later, so do not hesitate to send them as early as possible. The organizer will use these to plan the conference and organize the sessions. Please go to the submission form (available soon.) Regular talks are limited to 30 minutes, a time that includes interruptions for questions, and final discussion. It would be best to plan for twenty minutes of actual speaking. The talks should be aimed not at specialists, but at a general scientific audience.

There is room on the program for about 42 30-minute talks. If there are more than 42 attendees wanting to present research, then the organizer will either choose some talks to be of shorter duration, or in extremity, decide which attendees will give presentations. Thus when registering and filling out the submission form, please indicate if you might be willing to 1) give a shorter talk; 2) forego giving a talk.

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Travel To Hotel Oswald, Selva
Travel to and around Val Gardena

Note: This site will be elaborated later.

Note: It is a good idea to explore the area of Val Gardena with Google Maps, and Google Earth.

HOW TO REACH SELVA AND HOTEL OSWALD

Several websites provide information about air, train, car, and bus services. E.g. see: http://www.val-gardena.com/en/how-to-get-there/page373.html.

BY PLANE:

The main international airports giving the best access to Val Gardena and Selva are Venice, Italy, about three hours driving, and Innsbruck, Austria, about two hours driving. There are smaller and closer airports, but not usually ones with international flights.

BY CAR:

From Innsbruck: A13 and A22 south over Brennero Pass, SS12 to SP82 to SS242d to SS242. (~2 hrs).

From Venice: A27 to SS51 to SP251 to SR48 to SS244 to SS243 (about 3 hrs).

BY TRAIN AND BUS:

A variety of connections are available from the north or south. There are many local buses in Val Gardena.

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Lodging

We have placed a hold on rooms sufficient for our conference needs at Hotel Oswald, Selva, Val Gardena, Italy. This is an excellent hotel with high ratings, spa facilities, and an outstanding restaurant. The hotel website is at: http://www.hoteloswald.com/en/.

LODGING RATES

Lodging rates include breakfast and dinner for each person each day. Lodging reservations should be made early starting in the fall of 2015.

Deposit:

30% of the total charges at the time of booking, until June 1.

70% from June 1 to June 28.

100% after June 28.

Cancellation:

A full refund (minus a small handling fee) is made if cancellation occurs prior to May 1.

After May 1, until June 1, the 30% fee is nonrefundable.

After June 1, the hotel requires 70% of the total charges (non-refundable if cancelled.)

After June 28, the hotel requires 100% of the total charges (non-refundable if cancelled.)

Insurance:

The hotel offers cancellation insurance in case cancellation is necessary due to certain unforeseen circumstances that are listed on the following site: http://www.hoteloswald.com/en/prices-offers/prices/insurance-coverage.html. The cost of the travel insurance is calculated at 5% of the booking rate. (Contact the hotel for questions about this offer.) Feel free to investigate and purchase other forms of trip cancellation or interruption insurance.

Rates:

- One person/single room (only six single rooms available): E102/day.
- One person in double room: E142
- Two persons in a double room: E84/person/day
- Two persons in family suite (2 bdrms,2 baths): E102/person/day
- Three persons in family suite: E94/person/day

There are a variety of discounted prices for children of various ages, but it is best to contact the hotel to determine lodging possibilities and pricing that will apply to your family situation.
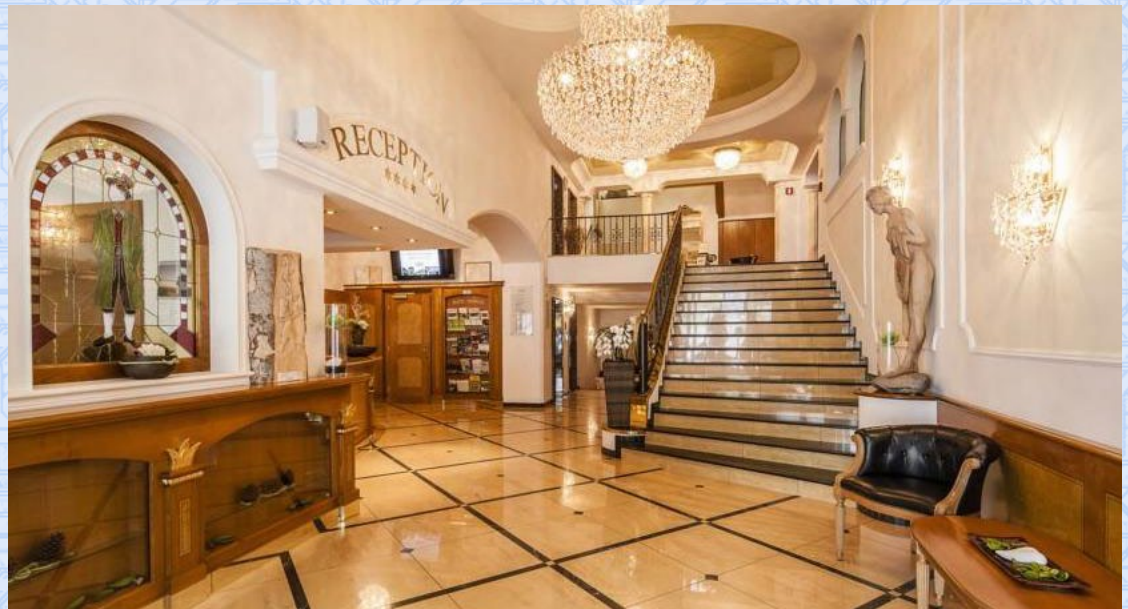
Reservations:

The hotel is very busy in high season, so it is important to reserve early. When ready to reserve, send me an email indicating you are about to do so, and I will respond with a conference password (please keep this private). Then book by calling the hotel at the number below and make reservations with the provided password--they will ask for the appropriate deposit. You can also email the hotel and use the password to make reservations, but I would not recommend putting credit card information in the email. Instead, you can send a deposit by bank transfer to:

Raiffeisenkasse Selva Val Gardena, Italy, Hotel Oswald
IBAN: IT 82 Y 082385889000300002674, Swift-Bic: RZSBIT21055

or you can book using the hotel's online service at:

https://ssl.serverclienti.com/val-gardena.net/pay/oswald/eng/pay.asp

Parking:

Parking is E5/day.

Internet:

Wireless Internet (WIFI) is free in public areas of the hotel, and in the guest rooms.

Address and Telephone:

HOTEL OSWALD****
Via Meisules 140
I-39048 Selva Val Gardena
Tel. +39 0471 795151 - Fax +39 0471 794131
E-mail:

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Meals/Dining/Breaks

A generous breakfast buffet and four-course dinner will be in Hotel Oswald, included in the lodging pricing.

Note that there will be a catered reception each day to start the conference proceedings at about 15:45, with drinks and finger food. This will take place next to the hotel in the city conference center. The registration fee will pay for the food and drink at these conference reception/breaks.

Breakfast will be served each day from 7:30 to 10:00. Dinner will take place after the conference talks end, about 20:15-20:30. The offerings at dinner will change from day to day, but will include choices for vegetarians.

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Activities

The Val Gardena area offers the variety of activities, spectacular scenery, and nature of the surrounding area that was present for ASIC 2013 held in Cortina d' Ampezzo. In particular activities include hiking, biking, via ferrata, rock climbing, parasailing. There is easy and convenient accessibility to most activities from roads, lifts, and refugios.

The photos above and below show parts of a Via Ferrata, protected hiking paths that are found throughout the Cortina area, and offer exciting and extraordinarily scenic but safe opportunities to explore the heart of the Dolomites.

The opportunities for outdoor activities in the summer in the Val Gardena area are endless, and include walking, hiking, scrambling, Via Ferrata, canyoning, mountaineering, rock climbing, mountain biking, road biking, and parasailing. In Val Gardena in the summer there are many concerts, shows, performances, museums, parks, adventure parks. There are

many towns and villages with rich histories.

It is perhaps easiest to get to the start of these activities by car, but there is excellent bus service in and around the area.

In addition to the various outdoor activities, summer in Val Gardena offers concerts, shows, performances, museums, parks, adventure parks. There are also many towns and villages with rich histories.

It is possible to access the various sites in Val Gardena by car, but there is excellent and frequent bus service throughout the valley, and Hotel Oswald provides a free bus pass to its guests. Because there is limited parking at some sites, and/or paid parking, attendees might well choose to use the bus system. Hotel Oswald is adjacent to a bus stop, making bus use particularly convenient.

Websites with useful information (also be sure to use Google Earth):
   http://www.valgardena.it/en/
   http://www.val-gardena.com/en/

The tourist office in Selva is at:

> Str. Mëisules, 213
>
> I-39048 Selva Gardena (BZ)
>
> E-mail:
>
> Tel.:   +39 0471 777900; Fax: +39 0471 794245
>
> Hours: Monday – Saturday: 08.00 – 12.00 & 14.30 – 18.30
>
>   Sunday: 09.00 – 12.00 & 16.00 – 18.30

A Selva town map is found at the link on:
   http://www.valgardena.it/en/val-gardena/villages/selva-gardena/
or at:
   http://www.mappery.com/Selva-Gardena-Tourist-Map

A map of Val Gardena showing terrain, hiking, and other features is found at:
   http://www.mappery.com/map-of/Val-Gardena-Summer-Trail-Map

Some books that could be useful:

   a. Hiking:
      - Trekking in the Dolomites; Henry Stedman;
        UK: ISBN 1-873756-34-8
      - The Dolomites of Italy; James and Anne Goldsmith;
        ISBN 1-55650-162-5; 1-55650-190-0; UK: 0-7136-3128-7
   b. Via Ferrata:
      - Via Ferratas of the Italian Dolomites: Vol 1; Smith and Fletcher;

UK: ISBN: 1-85284-362-4
- Via Ferrata-Scrambles in the Dolomites; Werner and Davies;
  UK: ISBN 1-85284-089-7
c. Climbing:
  - Classic Dolomite Climbs; Kohler and Memmel;
    US: ISBN 0-89886-693-6; UK: ISBN 1-898573-34-4
  - Dolomites-Selected Climbs; Ron James;
    UK: ISBN 0-900523-55-7
  - Dolomites, West and East: Alpine Club Climbing Guidebook
    (paperback). Ron James.
    ISBN-10: 0900523654; ISBN-13: 978-0900523656

Many more books can be found on Amazon.

AREA and DOLOMITE MOUNTAIN GROUPS

Immediately adjacent to Selva, to the south are the Sassalungo, Langkofel, and Sella dolomite groups. Also close, just to the north is the Odle group. North East is Stevia Southeast is Piz Boe. Heading east 32 km (toward Cortina) is Lagazuoi. South 35 km is the Rosegarten/Catinaccio group (with the Vajolet Towers). In this whole area, including the sites between these major groups, are uncountable numbers of well marked hiking paths that allow connections to and from various lift systems, rifugios, restaurants, via ferrata, and other mountain venues. All these allow convenient access to walks, hikes, scrambles, via ferrata, rock climbs and ever other sort of mountain activity one could want.

LIFTS AND CABLECARS

There are about 12 lifts and cablecars in Val Gardena open in the summer. There are others open in adjacent valleys and areas. These do not in most cases go to the tops of the dolomite peaks and towers, partly because the vertical relief is enormous, but they often gain several thousand feet of altitude and thereby give convenient access to the most dramatic hiking trails, climbing possibilities, biking trails and descents, Via Ferrata, parasailing options, and views and photo opportunities.

Generally one can purchase individual ride tickets, but it is more of a bargain, if one intends to uses many lifts, to buy a multiday pass. This year a three day adult pass is 60 euros, and a six day pass is 79 euros (children passes are considerably reduced, depending on age). A multiday pass is worth considering given that (this year) a one way single rides on most of the large lifts are about 11-16 euros, and single purchase round trips are about 14-28 euros. Lift hours vary but most start about 8:15 - 8:30.

RIFUGIOS

Access to climbing, via ferrata, and hiking sometimes is accessible from the roadway, and other times by cable car and lifts. Hiking, cable cars, or both often bring one to the many rifugio (high mountain lodges) scattered throughout the area, and the rifugio often serve as bases for excursions. I will describe the locations of the main refugios as this website is elaborated in the future. (I will also later indicate the location and hours of operations of the many lifts in the area).

Rifugios, Mountain Huts, Restaurants

There are a huge number of refugios, mountain huts, and restaurants of all sorts in Val Gardena. Some are on the roadside, but many are perched in dramatic positions high in the mountains. Even those high on the mountains typically offer lodging (for attendees possibly useful for days prior to or after ASIC) and meals (food being brought up daily from the valleys via cableways).

The site listed here describes and gives details about 62 of these:
http://www.valgardena.it/en/hiking-biking/walking-trekking/lodges-refuges/?offset=57&limit=7&RequestKey=144276354855fed31cba917

Even during the days of the conference these refugios, huts, and restaurants are an extremely useful resource. They provide excellent possibilities, while out and about in the mountains, for rest, food, drink, and views. Many are at the top of the lifts and cable cars, and provide easy access to climbing, via ferrata, biking and hiking, greatly cutting down the time needed for the same activities if started at the nearest road in the valleys.

HIKING

Many hiking itineraries (and much more including photos, videos, panoramas, terrain and via ferrata) are found on Google Earth.

The books and websites listed above have a number of hikes described in some detail. The Selva Tourist Office has hiking maps.

There are hundreds and possibly thousands of hiking paths and trails everywhere in and around Val Gardena. These are well maintained and marked by number, and vary considerably in length, difficulty, vertical gain and loss, and access. It would be impossible to try to list them on this website, but they offer outstanding opportunities for attendees at every level of walking/hiking/scrambling ability. In one way or another most connect the various rifugios, and often include peaks and dramatic viewpoints.

VIA FERRATA

Via Ferrata are protected hiking paths in the dramatic heights, cliffs, and spires of the Dolomites. The hiker uses a harness, slings and carabiners, and uses these to attach to cables that are themselves attached to the mountain cliffsides. Many via ferrata also use

ladders and bridges and some involve a bit of protected scrambling. They offer dramatic scenery and exposure normally available only to climbers but in almost perfect safety.

The via ferrata range from easy to difficult in terms of effort and exposure, and are all rated and described so the hiker can choose one that is appropriate. The books at the beginning of this section include several listing the many via ferrata including those in Val Gardena and the nearby areas.

Via Ferrata, although by definition protected, nonetheless can vary considerably in difficulty. The usual grading is on two scales, technical difficulty that ranges from I (easiest) to 5 (most difficult), and seriousness that ranges from A (easiest) to C (most serious).

If one does not have the harnesses, slings, carabiners (and helmets) needed for a via ferrata they will in most cases be available from the conference guides and failing that can be rented from a number of stores in Cortina.

Generally speaking anyone used to mountain hiking can manage most of the via ferrata without guides, but guides can be hired for this purpose, and can make the experience even more enjoyable, allowing choice of the best and most scenic and adventurous routes, ease of navigation, and safe instruction. We anticipate that one of the two conference climbing guides will lead a group at least once on an especially noteworthy via ferrata (we will have sign ups).

MOUNTAIN BIKING AND ROAD BIKING

Val Gardena is well known for summer biking, both mountain biking (many lifts give access to high starting points that allow exciting descents) and road biking. One can bring one's own bicycle, but there are shops that will rent. A bike trail map is available at the tourist office. There are far too many trails and itineraries to list on this website. A useful resource giving information is at: http://www.valgardena.it/en/hiking-biking/mountainbike-racing-bike/

ROCK CLIMBING

The rock climbing possibilities around Val Gardena are endless. The books listed on this website give descriptions and locations of many of the more famous climbs.

We will arrange at least one and likely two 'group' climbing days that allow beginners, novices, and children to try rock climbing. We usually try to have all climbers of all levels of abilities join in the excursion. The better climbers join the guides to help at the start of the event, but then move on to harder climbs in the same area. The sites are chosen to have many one pitch 'top rope' climbs suitable for beginners, but also have climbs of all levels of difficulties so that all climbers enjoy themselves.

The first group climbing day is scheduled for Monday July 4, the second day of the conference. As the conference date approaches we will assess the likely number of climbers coming, and their levels of experience, and will arrange for the appropriate number of guides. There will be a modest charge for attendance, to cover costs of equipment and the local guides. A second day will be chosen later, depending on interest.

The group climbing day(s) have proven to be a very popular activity and the numbers attending seem to grow every year. Please consider giving this a try at ASIC 2016. This is particularly to be recommended because we will be going to Sella Pass on Monday, an incredibly dramatic and pleasant site. It has many easy and moderate climbs (and harder ones) in an area peppered with large boulders with bolted routes in a see of trees and grass, and surrounded by enormous and startling Dolomitic peaks, particularly Sassolungo and the Sella group.

Time permitting the group traditionally stops for gelato on the way back to the conference.

There are several climbing guide centers in Selva, one directly across the street from Hotel Oswald. Several shops sell climbing guide books and maps, one being also across the street from the hotel.

MOUNTAINEERING

The many peaks in Val Gardena and the surrounding areas allow a variety of mountaineering ascents, albeit the distinction between long rock climbing routes, scrambling, via ferrata, and hiking to gain these peaks sometimes gets blurred. Perhaps the main 'mountaineering' concern is time: If one attempts a high peak from a low starting elevation the extremely large vertical relief will generally entail a very long day, likely making it impossible to return in time for the conference talks. Thus this type of mountaineering, at whatever degree of technical climbing is sought, should likely be planned for days prior to or after the conference.

CANYONING

Canyoning is suitable for beginners with no experience but is an exciting and enjoyable outing. One wears a wetsuit to insure warmth, then enters a stream in a narrow canyon high in the dolomites. Then one descends the stream, by walking, scrambling, floating, and sliding, whenever conditions allow. When cliffs are encountered the guide lowers the client on a rope. The canyoning areas are some distance from the hotel, so when considering any outings, please look carefully at the times of the itinerary so that a return can be made in time for the day's conference.

PARASAILING

Parasailing, or paragliding, is a sport in which one leaves a high point in the mountains by use of a large parasail (see photo), and then sails with the wind currents high over the mountains and cliffs, until eventually descending and landing (gently) at a designated pick up spot. This activity appears to be suitable only for experts but is actually available for anyone without experience, with use of what is known as 'tandem' flying: The flight is done with an expert guide and the client on a single large parasail: The expert does the flying and the client enjoys the experience. Tandem paragliding provides an exciting and exhilarating experience and is the closest one can come to what it feels like to be a bird in flight. Paragliding in the Dolomites gives the additional benefit of extraordinary scenery.

There are too many Via Ferrata accessible by day from Selva to list on this website, and I suggest examining the Cicerone guidebook by Smith and Fletcher for details (or other sources on the web). There are 6-7 Via Ferrata northeast of Selva (near La Villa), 4-5 very close to Selva, 7-8 near Passo Gardena, 4-5 southeast of Selva near Arabba, 15 or more southwest near Canazei, and 5 or so near Falzaego Pass to the east. In sum, there are something like 45 Via Ferrata accessible for day tours from Selva, covering the full range of lengths and difficulties.

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Format / Schedule

There will be a single speaking session each day each with seven (or more) talks. These sessions will be held in a conference room at the city conference center directly behind Hotel Oswald. Normal talk duration will be 30 minutes including questions and discussion. However, if there are more than 42 presenters, then some talks will be assigned shorter time limits. Information on submitting proposals for presentations is on the page of this website labeled "Talk and Poster Submissions".

The conference will start with registration and a reception at 15:30 on Sunday, July 3. On subsequent days there will be drinks and light snacks from about 15:45 - 16:15, followed by a speaking session include a mid-session 15 minute drink break. Dinner will follow the session at about 20:15-20:30.

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Sessions

ASIC 2016 Schedule: Talk Order Each Day Determined by the Chair.
Total Time for Talk, Questions, Setup, Interruptions: 25 minutes.
Food and Drink will be available about 20 minutes prior to each session start, at the
conference venue, behind Hotel Oswald (cross the bridge over the creek).

Sunday, July 3, 4:00pm	
Oberauer, Chair	Does rehearsal help immediate serial recall?
Walasek	Income inequality and positional consumption online
Sanborn	People are normative some of the time: Mixing combination rules
Regenwetter	The construct-behavior gap in behavioral decision research
Huber	Episodic memory and spatial navigation in the MTL
Sperling	Attention filters for features. New results
Anders	Merging regression with sequential sampling models
Cowell	Computational model of perceptual deficits in MTL amnesia
Franconeri	Visual exploration and communication of patterns in data

Monday, July 4, 4:00pm	
Dunn, Chair	Testing models of reasoning with signed difference analysis
van Ravenzwaaij	The EZ Diffusion Model: A powerful test of empirical effects
French	A new fading-Gaussian activation-based model of interval-timing
Landy	Systematic structure in ignorance and political misinformation
Gorea	Confidence levels during perception are discrete not continuous
Guest	What the success of brain imaging implies about the neural code
Halpern	Constrained optimization: Modeling selection in categorization
Holden	Intentional control of cognitive dynamics
Holmes	New approach for modeling decisions about changing information

Tuesday, July 5, 4:00pm	
Donkin, Chair	Exploring Bayesian decision rules in visual working memory

Ziegler	Modeling and predicting individual dyslexia patterns
McNamara	Individual differences in cue combination during navigation
Lewandowsky	Quantitative constraints on intergenerational social discount rate
Malmberg	Toward a model of the problem of autobiographical memory
Matzke	Avoid shortcuts in modeling hierarchical data
Melcher	Temporal windows and perceptual cycles organize vision
Stoianov	The perceptual code in reading: explaining spatial variance
Talmi	Modeling the list composition effect on emotional memory

Wednesday, July 6, 4:00pm

Love, Chair	Coherency maximizing exploration in the supermarket
Shiffrin	Learning during short-term scanning
Musca	Does word frequency explain free recall?
Brown	A rank-based approach to preferences and judgments
Palmeri	Modeling Perceptual Expertise
Kouider	Consciousness and predictive coding in the infant brain
Pauli	Of cognitive models in ancient, subcortical brain structures
Pecher	Grasp compatibility effects
Rehder	Beyond Markov: The Beta-Q model of causal reasoning

Thursday, July 7, 4:00pm

Sloutsky, Chair	The development of categorization
Bhatia	Modeling associative judgments with vector space semantics
Trueblood	When are causal representations quantum versus classical?
Cheng	Causal invariance aspiration shapes our causal representations
McLaughlin	Modeling feedback response to in verbal rule-based categorization
Mullett	Attention and behavioral phenomena in choice models
Simen, Patrick	Robust time scale invariance in timing and perceptual decisions
Speekenbrink	Exploration and exploitation in contextual multi-armed bandits
Steil	Scaling exploratory robot learning from motor to social learning

Friday, July 8, 4:00pm

Yearsley, Chair	Quantum and classical models of causal political judgments
Jones	Logical incoherence of game-theoretic rationality
Pezzulo	Multi-attribute choices: inter-temporal and effort-based decisions
Ramscar	Neuropsychological tests exaggerate "healthy cognitive decline."
Averbeck	Markov decision processes and exploration-exploitation

	Testolin	Letter perception emerges using deep neural networks
	Trcek	Attributing 'trust' to specific parts of the nervous system
	Usher	Selective-integration: accounting for decoy effects
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Listing by speaker

Speaker	Anders, Royce
Author 1	Anders, Royce Aix-Marseille University, France
Author 2	Oravecz, Zita Penn State University, USA
Author 3	Alario, F.-Xavier Aix-Marseille University, France

Title	New Developments in Reaction Time Analysis: Merging Regression with Sequential Information Sampling Models
Abstract	This talk will focus on new developments for analyzing reaction time (RT) data at greater depths. Most notably, I will discuss a new framework that we have developed for bridging together two of the major approaches for RT analysis: regression and sequential sampling (or evidence accumulation) models. While these approaches have been previously used separately to analyze RTs differently, we have developed a new framework which allows the benefits of these approaches to be combined. Specifically in contrast to traditional evidence accumulation, the combined approach allows for more experimental factors to be analyzed jointly (by economizing the number of observations needed per experimental design cell); an explicit/simultaneous modeling of specified experimental main effects, interactions, covariates, and inter-parameter correlations; and provides the capacity to fit or predict incomplete data (e.g., missing/unobserved experimental design cells). These valuable advantages previously associated with just regression, are hence combined with the tradition of evidence accumulation, which brings its own notable contributions to better understand the cognitive mechanisms underlying the RT data. I will also share other notable developments for detailed RT distribution analysis, coupled with cognitive process modeling.

Speaker	Averbeck, Bruno
Author 1	Averbeck, Bruno NIH
Title	Markov decision processes and the explore-exploit trade-off
Abstract	If a new restaurant opens in your neighborhood do you stop in for dinner, or do you stick with one of your familiar options that you know has reliably good food? More generally, should you exploit choice options of known reward value, or should you explore novel options that may turn out to be more rewarding? This question is known as the explore-exploit trade-off, and it is fundamental to learning in dynamic environments. In reinforcement learning, this trade-off is often managed by manipulating the amount of noise in decision processes -- sometimes choosing options that are not as rewarding or are not known to be rewarding, to learn about them. It is possible, however, to explore in a directed way if you have some knowledge of the statistics of your environment. Directed exploration is information gathering. I will discuss a theoretical framework that allows one to carry out optimal directed exploration. The framework defines the conditions under which exploration is more or less valuable. We will also examine some situations where we can use the framework to characterize behavior.

Speaker	Bhatia, Sudeep
Author 1	Bhatia, Sudeep University of Pennsylvania
Title	Modelling Associative Judgment
Abstract	I study associative processing in high-level judgment using vector space semantic models. I find that semantic relatedness, as quantified by these models, is able to provide a good measure of the associations involved in judgment, and in turn predict responses in a large number of existing and novel judgment tasks. My results shed light on the representations underlying judgment, and highlight the close relationship between these representations and those at play in language and in the assessment of word meaning. In doing so, they show how one of the best-known and most studied theories in decision making research can be formalized in order to make precise quantitative a priori predictions for a large class of natural language judgment problems.

Speaker	Brown, Gordon
Author 1	Brown, Gordon University of Warwick
Author 2	Walasek, Lukasz University of Warwick
Title	The Stability of "Unstable" Preferences and Judgments: A Rank-based Approach to Choice
Abstract	Models in economics and psychology typically aim to identify invariances in people's behaviour — i.e., descriptions of choices that remain true across different contexts. It is typically assumed that people can be understood as possessing internal stable preferences (e.g., for cheese of a given sharpness, or beer of a particular strength), and that behavioural invariances can be expressed in terms of such preferences. However, the pervasive context-dependence of judgement and choice suggests that either (a) choices cannot be understood in terms of preferences, or (b) preferences are unstable and hence that there are no invariances to be identified. Moreover, the conventional approach assumes that people can compare different attribute values on a common scale, yet people often cannot do this (the incommensurability problem). Here we offer an alternative approach to identifying invariances: Relative Rank Theory (RRT). RRT abandons both the idea that everyday choices result from options being valued on a single scale, and the idea that invariances in choice can be understood in terms of underlying preferences expressed in real-world coordinates. Instead, RRT assumes that utility values are not available and that choices are

based on judgements of relative rank constructed from binary ordinal comparisons. Thus invariances in choice may require preferences to be stated in rank-based, rather than real-world, coordinates. Different attributes may only be compared when different dimensions may be mapped into a common third dimension by a process called relative rank matching.

Speaker	Cheng, Patricia
Author 1	Cheng, Patricia UCLA
Title	How causal invariance as an aspiration shapes our causal representation of the world
Abstract	Causal invariance is the sameness of how a cause operates across contexts. This talk will explain and illustrate the three roles of causal invariance — aspiration, criterion for hypothesis revision, and default assumption — in scientific reasoning and intuitive causal reasoning, the latter in humans and in rats. The aspiration role drives the other two. These roles are essential to constructing a stable causal representation that is useable, that is, generalizable from the learning context to an application context.

Speaker	Cowell, Rosemary
Author 1	Cowell, Rosemary University of Massachusetts Amherst
Author 2	Sadil, Patrick University of Massachusetts Amherst
Title	A Computational Model of Perceptual Deficits in Medial Temporal Lobe Amnesia
Abstract	Damage to the Medial Temporal Lobe (MTL) has long been known to impair declarative memory. More recent evidence suggests that MTL damage also impairs visual perception. One recent study of visual discrimination behavior revealed a surprising anti-perceptual learning effect in MTL-damaged individuals: with exposure to a set of visual stimuli, discrimination performance worsened rather than improved (Barense et al., 2012). We present a computational model that explains this paradox by assuming that difficult visual discriminations are performed using a familiarity heuristic (i.e., subjects compare the relative familiarity of the two to-be-discriminated items). We simulate these results by instantiating the familiarity heuristic mechanism for visual discrimination in a neural network model that was previously used to simulate impairments in recognition memory (Cowell et al., 2006). The model thus accounts for both mnemonic and perceptual deficits caused by MTL damage

using a unified architecture and mechanism.

Speaker	Criss, Amy
Author 1	Criss, Amy Syracuse University
Author 2	Kilic, Asli
Author 3	Malmberg, Ken University of South Florida
Author 4	Fontaine, Jessica Syracuse University

Title	Feedback and Interference in Memory

Abstract	Understanding interference in episodic memory is critical. Studies have shown a small and somewhat unreliable decrease in accuracy when items are added to the study list, called the list length effect (LLE) and a rather large and robust decrease in accuracy when items are added to a test list, termed output interference (OI). We simultaneously evaluate the effects of adding items during study and adding items during test. Feedback presented during test played an unexpected role. When feedback was present, OI was smaller in magnitude and the size of the LLE was larger. Here we present efforts to model the role of feedback within the REM model.

Speaker	Donkin, Chris
Author 1	Donkin, Chris UNSW Australia
Author 2	Nosofsky, Robert Indiana University

Title	Exploring Bayesian decision rules in visual working memory

Abstract	The most successful model of visual working memory posits that visual working memory resources are distributed among to-be-remembered items in a continuous and varied manner. The model requires no explicit guessing process, and yet is capable of capturing the many documented cases of guessing - responses that are independent of the memoranda. However, the apparent guessing behavior is driven by the Bayesian decision-making machinery, and the (arguably implausible) knowledge to which it is granted access. Consideration of this model of visual working memory reveals to two important issues with respect to Bayesian models of cognition. First, the psychological plausability of the knowledge or information granted to the model is of critical importance, though difficult to

discern. Second, the discarding of unreasonable 'ideal-observer' assumptions will often yield infinitely many possible Bayesian models, making it difficult to argue that such models are necessarily optimal or normative.

Speaker	Dunn, John
Author 1	Dunn, John University of Adelaide
Author 2	Stephens, Rachel University of New South Wales
Author 3	Hayes, Brett University of New South Wales
Author 4	Anderson, Laura Binghamton University

Title	Testing models of reasoning with signed difference analysis.
Abstract	An ongoing debate is whether human reasoning is best accounted for by one or two processes. Single process models propose that reasoning judgments are based on the assessment of a single kind of argument strength (such as conditional probability) while dual process models propose a distinction between an intuitive or Type 1 judgment and a deliberative or Type 2 judgment. These models are frequently examined in the context of a task in which participants are asked to judge either the logical validity of an argument or the plausibility of its conclusion given the truth of the premises. The combination of two kinds of instruction and two kinds of argument (valid/invalid) leads to four dependent variables which can be modelled using basic principles of signal detection theory. This generates 6 distinct models that vary on the number of dimensions (one vs. two) and the number of distinct response criteria (0, 1, or 2). However, these models cannot be fit directly because the nature of the distributions of argument strength is unknown (and probably not normal). For this reason, we test the models using signed difference analysis (Dunn & James, 2003). This can be viewed as a "high dimensional" state-trace analysis and, like state-trace analysis, allows predictions to be generated under arbitrary monotonic transformations of the dependent variables. We apply this approach to a database of 204 observations drawn from over 20 different studies in order to determine which, if any, model can account for these data.

Speaker	Franconeri, Steven
Author 1	Franconeri, Steven

	Northwestern University
Title	Now you see it: Visual exploration and communication of patterns in data
Abstract	Within a well-designed visualization, your eyes can be a powerful tool for exploring and understanding patterns in data. But within a poorly-designed depiction of the same data, the same tasks can be inefficient, or even overwhelming. We'll discuss how data visualization relies on the systems that we use to perceive the natural world, and how research into the power and limits of those systems inspires prescriptions for effective visualization design.

Speaker	French, Bob
Author 1	French, Bob LEAD-CNRS UMR 5022 / University of Burgundy-Franche-Comté
Author 2	Addyman, Caspar Goldsmiths, University of London
Author 3	Mareschal, Denis Birkbeck, University of London
Author 4	Thomas, Elizabeth INSERM U1093 University of Burgundy-Franche-Comté

Title	Unifying prospective and retrospective interval-time estimation: A new fading-Gaussian activation-based model of interval-timing
Abstract	Hass and Hermann (2012) have shown that only variance-based processes will lead to the scalar growth of error that is characteristic of human time judgments. Secondly, a major meta-review of over one hundred studies (Block et al., 2010) reveals a striking interaction between the way in which temporal judgments are queried (i.e., retrospectively or prospectively) and cognitive load on participants' judgments of interval duration. For retrospective time judgments, estimates under high cognitive load are longer than under low cognitive load. For prospective judgments, the reverse pattern holds, with increased cognitive load leading to shorter estimates. We describe GAMIT, a Gaussian spreading-activation model, in which the sampling rate of an activation trace is differentially affected by cognitive load. The model unifies prospective and retrospective time estimation, normally considered separately, by relating them to the same underlying processes, in particular, attentional resource sharing. The scalar property of time estimation arises naturally from the model dynamics and the model shows the appropriate interaction between mode of query and cognitive load.

Speaker	Gorea, Andrei
Author 1	Gorea, Andrei Université Paris Descartes and CNRS
Author 2	Lisi, Matteo Université Paris Descartes
Author 3	Mongillo, Gianluigi Université Paris Descartes and CNRS
Title	Confidence levels during perceptual decision-making are discrete not continuous
Abstract	Animals (including humans) are able to assess the quality of incoming sensory information and act accordingly while taking decisions. The computations underlying such ability are unclear. If neuronal activity encodes probability distributions over sensory variables, then uncertainty – hence confidence – about their value is explicitly represented and, at least in principle, readily accessible. On the other hand, if neuronal activity encodes point-estimates, then confidence must be obtained by comparing the level of the evoked response to fixed (possibly learned) criteria. To address this issue we developed a novel task allowing the behavioral read-out of confidence on a trial-by-trial basis. Each trial consisted of two consecutive decisions on whether a given signal was above or below some reference value, call it zero. The first decision was to be made on a signal uniformly drawn from an interval centered at zero. Correct/incorrect responses resulted into signals uniformly drawn from the positive/negative sub-intervals to be judged when making the second decision and subjects were told so. The task reliably elicited confidence assessments as demonstrated by the finding that second decisions were more frequently correct than first decisions. We compared the ability of Bayesian and non-Bayesian observers to predict the empirically observed pattern of both first and second decisions. The non-Bayesian observer was designed to have discrete confidence levels instantiated by one, two or three second-decision criteria representing different levels of the evoked response. Different confidence levels resulted into different level depended on the amplitude second-decision criteria. Synthetic data-sets reliably discriminated Bayesian from non-Bayesian observers. The non-Bayesian observer with two-three confidence levels systematically (over 9 subjects) outperformed the Bayesian observer in predicting the actual behavior. Hence, contrary to previous claims, confidence appears to be a discrete rather than continuous quantity. Simple heuristics are sufficient to account for confidence assessment by humans making perceptual decisions.

Speaker	Guest, Olivia
Author 1	Guest, Olivia

	University of Oxford
Author 2	Love, Bradley University College London
Title	What the Success of Brain Imaging Implies about the Neural Code
Abstract	The success of fMRI places constraints on the nature of the neural code. The fact that researchers can infer similarities between neural representations, despite limitations in what fMRI measures, implies that certain neural coding schemes are more likely than others. For fMRI to be successful given its low temporal and spatial resolution, the neural code must be temporally and spatially smooth. Through proof and simulation, we evaluate a number of reasonable coding schemes and demonstrate that only a subset are plausible given both fMRI's successes and its limitations in measuring neural activity. Coding schemes that borrow from deep belief networks and classical connectionist approaches are recoverable in simulated fMRI studies. These results suggest that brain models and neural measures need not be extremely fine grained to bridge between brain and behaviour.

Speaker	Halpern, David
Author 1	Halpern, David New York University
Author 2	Gureckis, Todd New York University
Title	Constrained Optimization of Measurements: A model of information selection in categorization
Abstract	Selective attention has been a crucial feature in many theories of categorization. In many influential theories (Nosofsky 1986, Kruschke 1992), selective attention is implemented through a set of decision weights such that more relevant features of the category are weighted higher in the final categorization decision. In this project we instead take the view that attention can instead be viewed as a type of information sampling. Under this view, allocating attention to a feature means collecting more information about that feature so as to reduce uncertainty about the exact value that feature takes on. Since certain features may be more relevant to categorization and only a limited amount of information can be collected, an attention allocation is optimal when it maximally reduces uncertainty in the final categorization decision. We present a theoretical analysis, and empirical study, examining how people decide to gather more or less precise information about features prior to making a categorization decision.

Speaker	Holden, John G.
Author 1	Garcia, Olivia P. University of Cincinnati & Cintas Corp.
Author 2	Holden, John G. University of Cincinnati
Title	Intentional Control of Cognitive Dynamics
Abstract	A series of lexical decision studies that manipulate speed-accuracy trade-offs are used to test the basic hypothesis that intentional change is reflected in performance in the same way that control parameters influence the dynamics of artificial complex networks.

Speaker	Holmes, William
Author 1	Holmes, William Vanderbilt University
Author 2	Trueblood, Jennifer Vanderbilt University
Author 3	Heathcote, Andrew University of Tasmania
Title	A new framework for modeling decisions about changing information
Abstract	In the real world, people integrate non-stationary information that changes systematically while the decision is in progress. Although theories of decision-making have traditionally been applied to paradigms with stationary information, non-stationary stimuli are now of increasing theoretical interest. We used perceptual stimuli that change at discrete time points during decisions along with cognitive modeling to investigate how the decision process is updated when a stimulus changes. To investigate the underlying changes in the decision process after the stimulus change, we developed a series of Piecewise Linear Ballistic Accumulator models (PLBA). The PLBA is efficient to simulate, enabling it to be fit hierarchically to participant choice and response-time distribution data using probability density approximation (PDA) methods. We similarly develop and fit a Piecewise Drift Diffusion Model (PDDM) to compare and contrast the inferences of the two models.

Speaker	Huber, David
Author 1	Huber, David University of Massachusetts, Amherst

Author 2	Solstad, Trygve Norwegian University of Science and Technology
Title	Episodic Memory and Spatial Navigation in the Medial Temporal Lobe
Abstract	Hippocampal place cells and entorhinal grid cells are abundant, suggesting that the medial temporal lobe (MTL) primarily supports spatial navigation. At the same time, neuropsychological studies find that the MTL supports the formation of episodic memories. We explain this seeming contradiction with a hierarchical memory model in which episodic memories are points in a high dimensional space. Because the X/Y dimensions used to analyze place and grid cells are part of this representation, different levels of the hierarchy give the appearance of place and grid cells when only analyzed in terms of the X/Y plane. We propose that X/Y position information is provided by border cells, which is combined with the true attributes of grid cells (e.g., something other than X/Y, such as temperature, surface texture, time of day, etc.) to produce cognitive maps and ultimately multidimensional episodic memories in the hippocampus. Place cell responses are retrieved memory responses that occur when the animal is in a position sufficiently close to the location of a prior experience. Memory consolidation separates memories in the multidimensional space, producing a hexagonal array of place cells. The response of a cell representing a non-spatial attribute common to the entire set of memories is hexagonal in the X/Y plane owing to excitatory feedback from each place cell. Thus, rather building place cells out of grid cells, as proposed by other models, our account builds grid cells out of place cells. Furthermore, our account proposes that place cells are episodic memories and grid cells are non-spatial.

Speaker	jones, matt
Author 1	Jones, Matt university of Colorado
Title	Logical incoherence of game-theoretic rationality
Abstract	Modern normative game theory is founded on extending instrumental rationality to cases of multiple agents: Not only do individuals choose rationally, but they expect each other to behave rationally as well. Thus rational behavior is defined recursively, and in fact circularly. I argue that this game-theoretic notion of rationality is logically inconsistent and hence meaningless. I do this first by building on analysis of the one-shot prisoner's dilemma by Shiffrin, Lee, and Zhang. I then focus on the celebrated backward induction argument for finitely repeated games, using the centipede game as an example. I prove that, following certain paths in the game's decision tree, a rational player's behavior is undefined. Consequently, the opponent cannot evaluate the options at earlier

steps, and has no basis for action. Recursive rationality leads to paralysis. Time permitting, I will discuss some alternative theoretical approaches that might avoid this problem.

Speaker	Kouider, Sid
Author 1	Kouider, Sid CNRS and Ecole Normale Supérieure
Author 2	Goupil, Louise CNRS and Ecole Normale Supérieure
Author 3	Gelskov, Sofie CNRS and Ecole Normale Supérieure
Title	Developing a reflective mind: consciousness, predictive coding and metacognition in the infant brain
Abstract	This talk will focus on whether and how infants 1) experience perceptual consciousness, 2) rely on bayesian inference during perception, and 3) rely on metacognitive sensitivity to track their own behaviors. I will first describe how one can test for perceptual consciousness in infants by relying on neural signatures of consciousness validated in adult populations. Our studies confirm the presence of these neural signatures in 5 to 15 month-old infants, albeit much slower. Regarding predictive coding, we combined EEG with a cross-modal cueing paradigm and show that neural responses for unexpected events are increased in 12 month-olds. However, this effect of prediction error was observed only during late processing stages. Early neural components, by contrast, revealed an amplification for predicted rather than surprising events, suggesting that selective attention enhances perceptual processing for expected events. These results demonstrate that the neural mechanisms underlying the use of predictive signals are already functional in infancy, but follow different dynamics depending on whether expected events are confirmed or instead surprising. Regarding metacognition, we demonstrate that infants reflect upon their own decisions to evaluate their accuracy and adapt subsequent behaviour. We show that after performing a binary choice, infants display appropriate decision confidence for correct compared to incorrect decisions. Furthermore, we show that an electrophysiological marker of error detection, the Error-Related Negativity, is elicited when 12 month-old infants make an incorrect decision. Hence, although explicit forms of metacognition might mature later during childhood, the mechanisms responsible for metacognitive sensitivity are already functional during the first year of life.
Speaker	Kouider, Sid

Author 1	Kouider, Sid CNRS and Ecole Normale Supérieure
Author 2	Goupil, Louise CNRS and Ecole Normale Supérieure
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Title	Developing a reflective mind: consciousness, predictive coding and metacognition in the infant brain

Abstract	This talk will focus on whether and how infants 1) experience perceptual consciousness, 2) rely on predictive codes during perception, and 3) rely on metacognitive sensitivity to track their own behaviors. We will first examine to test for perceptual consciousness in infants by relying on neural signatures of consciousness validated in adult populations. Our studies confirm the presence of these neural signatures in 5 to 15 month-old infants, albeit much slower. Regarding predictive coding, we combined EEG recordings with a cross-modal cueing paradigm and show that neural responses for unexpected events are increased in 12 month-olds. However, this effect of prediction error was observed only during late processing stages associated with perceptual consciousness. Early neural components, by contrast, increased for predicted rather than surprising events, suggesting that selective attention enhances perceptual processing for expected events. These results demonstrate that predictive codes are already functional in infancy, and reveal a privileged link between neural surprise and consciousness in infants. Regarding metacognition, we demonstrate that infants reflect upon their own decisions to evaluate their accuracy and adapt subsequent behaviour. We show that after performing a binary choice, infants display appropriate decision confidence by persisting more for correct compared to incorrect decisions. Furthermore, we show that electrophysiological marker of error detection are elicited in 12 month-old infants. Hence, although explicit forms of metacognition might mature later during childhood, the mechanisms responsible for metacognitive sensitivity are already functional during the first year of life. I will conclude on perspectives for learning and education.

Speaker	Landy, David
Author 1	Landy, David Indiana University

Title	Systematic structure in measures of ignorance and political misinformation

Abstract	Major polling companies (Gallup, Pew, and Ipsos Mori) as well as

academic surveys have attempted to assess people's knowledge, ignorance, and misinformation regarding politically important magnitudes, such as the proportion of the population that is foreign-born. Such surveys generally examine small sets of questions grouped by content area, and treat estimation error as indications of biased beliefs about true values. Prior research has sought explanations for errors in terms of person-specific or group-specific biases, for instance fear of minorities by majority groups (Wong, 2007) or a lack of familiarity with minority populations (Sigelman & Niemi, 2001). In contrast, we find that patterns previously reported as domain-specific bias are highly systematic across a wide range of different topics and are well characterized by traditional psychophysical models of probability estimation. After accounting for systematic estimation error, we find that biased beliefs often still exist, but that this bias is frequently in a direction opposite of what has been characterized by previous research. Furthermore the structure of this psychophysical response function is related in predictable ways to participants' levels of numeracy and political knowledge. We propose that previously reported biases must be reinterpreted; much apparent bias is best explained in terms of general cognitive factors rather than topic-specific ignorance. True misinformation is concealed by current analytic methods.

Speaker	Lewandowsky, Stephan
Author 1	Lewandowsky, Stephan University of Bristol
Author 2	Freeman, Mark Loughborough University
Author 3	Mann, Michael Penn State University
Title	Harnessing the uncertainty monster: Putting quantitative constraints on the intergenerational social discount rate
Abstract	There is broad consensus among economists that unmitigated climate change will ultimately have adverse global economic consequences, that the costs of inaction will likely outweigh the cost of taking action, and that social planners should therefore put a price on carbon. However, there is considerable debate and uncertainty about the appropriate value of the social discount rate, that is the extent to which future damages should be discounted relative to mitigation costs incurred now. We briefly review the ethical issues surrounding the social discount rate and then report a simulation experiment that constrains the value of the discount rate by considering 4 sources of uncertainty and ambiguity: Scientific uncertainty about the extent of future warming, social uncertainty about future population and future economic development, political uncertainty about future mitigation trajectories, and ethical ambiguity about how much the welfare of future generations should

be valued today. We compute a certainty-equivalent declining discount rate that accommodates all those sources of uncertainty and ambiguity. The forward (instantaneous) discount rate converges to a value near 0% by century's end and the spot (horizon) discount rate drops below 2% by 2100 and drops below previous estimates by 2070.

Speaker	Love, Bradley
Author 1	Love, Bradley University College London
Author 2	Riefer, Peter University College London
Title	Coherency Maximizing Exploration in the Supermarket
Abstract	In uncertain environments, effective decision makers balance exploiting options that are currently preferred against exploring alternative options that may prove superior. For example, a honeybee foraging for nectar must decide whether to continue exploiting the current patch or move to a new location. When the relative reward of options changes over time, humans explore in a normatively correct fashion, exploring more often when they are uncertain about the relative value of competing options. However, rewards in these laboratory studies were objective (e.g., monetary payoff), whereas many real-world decision environments involve subjective evaluations of reward (e.g., satisfaction with food choice). In such cases, rather than choices following preferences, preferences may follow choices with subjective reward (i.e., value) constructed to justify choice and maximize coherency. If so, the tendency to explore should lessen as uncertainty increases, contrary to previous findings. To evaluate this possibility, we examined the exploratory choices of more than 300,000 individuals in supermarkets over several years. Consumers' patterns of exploratory choice ran counter to normative models for objective rewards – the longer the exploitation streak for a product, the less likely were people to explore an alternative. These findings suggest interventions to promote healthy lifestyle choices.

Speaker	Malmberg, Kenneth
Author 1	Malmberg, Kenneth University of South Florida
Title	Toward a Model of the Problem of Autobiographical Memory
Abstract	Despite decades of formal development of human memory models, these models have not been extended from accounts of list learning to accounts of the everyday memory. In this talk, I propose that everyday memory poses a problem to solved, and everyday memory

problems are solved in similar ways to other problems. Specifically, everyday memory depends on general knowledge and inductive inference in order to mentally reinstate temporal context associated with past experience. I will present a preliminary data set and relate theoretical constructs of human memory to the brain's Default Mode Network.

Speaker	Matzke, Dora
Author 1	Matzke, Dora University of Amsterdam
Author 2	Boehm, Udo University of Amsterdam
Author 3	Marsman, Maarten University of Amsterdam
Author 4	Wagenmakers, Eric-Jan University of Amsterdam
Title	On the Importance of Avoiding Shortcuts in Modelling Hierarchical Data
Abstract	Psychological experiments often yield data that are hierarchically structured. Popular shortcut analysis strategies that fail to properly accommodate this hierarchical structure can result in biased conclusions. To gauge the severity of these biases, we conducted a simulation study in which we generated realistic response time data for a two-group experiment. In line with well-established theoretical results, our simulations showed that Bayesian and frequentist analyses that ignore the hierarchical data structure and rely on participant means are biased towards the null hypothesis. Analyses that take a two-step approach, submitting participant-level estimates from a hierarchical model to follow-up tests are biased towards the alternative hypothesis. Only fully hierarchical analyses of multilevel data lead to correct conclusions. We discuss the relevance of our results to clinical and neuropsychological studies that rely on Bayesian hierarchical parameter estimation.

Speaker	McLaughlin, Anne
Author 1	McLaughlin, Anne North Carolina State University
Title	Modeling response to feedback in verbal rule-based categorization tasks
Abstract	Feedback was manipulated after correct and incorrect answers in a series of four experiments to determine the effects of feedback type on performance, learning, and study behavior. A general benefit was found for feedback provided after incorrect responses. However,

participant behaviors were changed by altering the amount of information available in feedback after correct versus incorrect answers, showing that learners are attuned to the amount of information in feedback as well as having their attention directed by corrective feedback.

Speaker	McNamara, Timothy
Author 1	McNamara, Timothy Vanderbilt University
Author 2	Chen, Xiaoli German Centre for Neurodegenerative Diseases, Magdeburg
Title	Individual Differences in Cue Combination During Navigation
Abstract	We examined the manner in which people integrated visual cues and self-motion cues during spatial navigation when the two cues varied in reliability. Participants walked in immersive virtual reality from a starting location to three successive waypoints and then attempted to return to the first waypoint using (a) visual cues alone, (b) self-motion cues alone, (c) congruent visual and self-motion cues, or (d) incongruent visual and self-motion cues. Performance was statistically optimal, or nearly so, under most conditions. A striking discovery existed in the large individual differences in the extent to which participants were able to use visual cues relative to self-motion cues. These individual differences were positively correlated with the extent to which participants relied on visual cues relative to self-motion cues in double-cue conditions (c & d). Correlations among tests of spatial ability, measures of task performance, and confidence ratings showed that participants with higher mental rotation scores performed better with self-motion cues relative to visual cues, assigned greater weight to self-motion cues than to visual cues, and were more confident using self-motion cues relative to visual cues. The etiology and implications of these individual differences will be discussed.

Speaker	Melcher, David
Author 1	Melcher, David University of Trento
Author 2	Wutz, Andreas University of Trento; MIT
Author 3	Drewes, Jan University of Trento
Title	How temporal windows and perceptual cycles organize visual cognition

Abstract A basic idea in cognitive science is that perceptual and cognitive processes take time to complete, as measured for example by reaction times, Donders' subtraction method or ERPs. More recently, there has been converging evidence that perceptual systems also have an inherent temporal structure that is present even prior to stimulus presentation. Here, I will present recent work from my lab investigating how these temporal factors may create capacity limits in perception and working memory and how temporal windows influence our subjective interpretation of events. These studies, using behavioral measures, EEG, MEG and eyetracking, suggest a link between neural oscillations, visual perception, oculomotor planning and working memory. Overall, this work points to a critical role of the brain's time frames in organizing and aligning perception, cognition and action.

Speaker	Mullett, Tim
Author 1	Mullett, Tim University of Warwick
Title	Attention and Behavioural Phenomena in Choice Models

Abstract There are a number of phenomena that have been shown to have an almost ubiquitous presence across all decision making tasks. Many of these come from behavioural measurements, for example reaction time distributions almost always show a significant positive skew. More recently findings from eye tracking or attention measures have also shown stable characteristics. This includes the Late Onset Bias (often called the gaze cascade) and an overall bias to choose the item attended for longer. Specific forms of drift diffusion models have been extended with additional assumptions and have been shown to fit the data well. However, there are a large number of existing behavioural models which could accommodate these additional assumptions equally well, but have not been tested. Our approach has not been to model or fit every extant model. Instead, we take a more general approach: we test assumptions and properties that are common to many models to see which are necessary for a model to simultaneously explain common behavioural and attention phenomena. By using extensive cognitive modelling and parameter space partitioning we show that the stopping rule is the most significant factor. Models with a relative stopping rule (where a response is made based upon the magnitude of the difference in accumulated evidence) accurately capture these common phenomena at a range of parameter values. However, models with an absolute stopping rule are unable to do so, even after incorporating a range of additional assumptions such as feed-forward inhibition, mutual inhibition and decay.

Speaker	Musca, Serban C.

Author 1	Musca, Serban C. CRPCC lab - EA 1285, European University of Brittany at Rennes
Author 2	Chemero, Anthony Departments of Philosophy of Psychology, University of Cincinnati

Title	Does word frequency explain free recall?

Abstract	Is word frequency (WF) a key explanatory factor of free recall (FR)? Different models make contrary predictions on the relation between WF and FR performance, with some models predicting a positive and others a negative relationship. All models predict a monotonic relationship, yet the parametric study of Lohnas & Kahana (2013) found a non-monotonic relationship. This begs the question of whether it is genuinely WF that is at play or some other confounding variable. To ensure "WF effect" is that of word's frequency, one must show that a WF effect is found when controlling exhaustively for other explanatory variables. Starting from a thorough task analysis of FR that we carried out, including an analysis of the environmental and informational resources available, we propose, another explaining variable in addition to those already known as potential candidates (e.g., age of acquisition, number of phonemes). Our starting point was that the statistical structure of a language shapes the neural structure of people who learn it over many years and then use it daily, and that the overall pattern of these neural structures then determines the way participants remember words in FR tasks. We hypothesized that 'relative expectancy', a measure of the mismatch between the statistical properties of the to-be-recalled words in an experimental list and the statistical properties of the language as a whole, is a key explanatory factor in FR. Simulation of extant data and original experimental data are presented to support the idea of the relevance of the variable we propose.

Speaker	Oberauer, Klaus
Author 1	Oberauer, Klaus University of Zurich
Author 2	Souza, Alessandra University of Zurich

Title	Does rehearsal help immediate serial recall?

Abstract	The assumption that articulatory rehearsal is beneficial for immediate serial recall of verbal materials has been virtually taken for granted. Correlational evidence suggests that cumulative rehearsal in particular is beneficial for serial recall (Tan & Ward, 2008, PBR). Yet, there is no experimental evidence supporting a beneficial causal effect of rehearsal on immediate serial recall. Simulations with a generic model of serial recall revealed that a

mechanistic implementation of rehearsal as a maintenance mechanism protecting representations from decay is elusive (Lewandowsky & Oberauer, in press, PsychRev). We present two experiment that manipulate the frequency and the schedule of rehearsal, one with a simple-span and one with a complex-span task. Participants were instructed to remember a list of words in serial order and engage in cumulative rehearsal. They were instructed to rehearse overtly so their rehearsal could be monitored. The instruction increased the prevalence of cumulative rehearsal in comparison to a control condition in which participants were free to rehearse as they wished. Instructed cumulative rehearsal led to better recall of words from the beginning of the list at the expense of words at the end of the list. Nevertheless, participants did not recall more words overall in the instructed-rehearsal condition than in the control condition, showing that cumulative rehearsal does not improve performance in serial recall.

Speaker	Palmeri, Thomas
Author 1	Palmeri, Thomas Vanderbilt University
Author 2	Annis, Jeffrey Vanderbilt University
Author 3	Shen, Jianhong (May) Vanderbilt University
Title	Modeling Perceptual Expertise
Abstract	Perceptual experts have remarkable abilities at quickly and accurately categorizing and identify objects within their domain of expertise. We have been conducting a large-scale project testing individuals with a wide range of birding expertise on their categorization, perception, and memory with the aim of developing models that explain how and why performance varies over the expertise continuum. I will explain why we test expert birders, how we recruit these perceptual experts for online web-based experiments, and how we evaluate their expertise. I will describe experiments that test their categorization and memory. Performance of individuals on these experiments is modeled using a hierarchical Bayesian version of the Linear Ballistic Accumulator model. This modeling effort allows us to characterize parameters that vary with degree of perceptual expertise and provide a starting point for developing more fine-grained models that explain how and why certain parameters vary with expertise.

Speaker	Pauli, Wolfgang M.
Author 1	Pauli, Wolfgang M. California Institute of Technology

Author 2	O'Doherty, John P Calilfornia Institute of Technology
Title	The human striatum represents cognitive maps during higher-order appetitive Pavlovian learning
Abstract	fMRI BOLD responses in the subcortical striatum have repeatedly been found to scale with reward anticipation and prediction errors during Pavlovian learning. In other work, striatal BOLD signals during multistep decision tasks have been found to also represent model-based information about state transitions during human choice behavior. Less is known about the involvement of the striatum during model-based Pavlovian learning. Here we scanned human participants with high spatial and temporal resolution fMRI (1.8 mm, 600 ms) focused on subcortical brain areas, while they participated in a sequential Pavlovian conditioning paradigm involving an appetitive outcome (a pleasant juice). Critically, this paradigm enabled an investigation of whether striatal BOLD responses only covaried with expected probability of future reward, or whether BOLD responses also encoded information about the sequence of events leading up to reward delivery. The results of our multivoxel patterns classification analyses suggest that the striatum does indeed support a cognitive map of state transitions during high-order Pavlovian learning.

Speaker	Pecher, Diane
Author 1	Pecher, Diane Erasmus University Rotterdam
Author 2	Canits, Ivonne Erasmus University Rotterdam
Author 3	Zeelenberg, René Erasmus University Rotterdam
Title	Grasp compatibility effects
Abstract	Responses to pictures of graspable objects are influenced by the similarity between the response action itself and the grasping actions that could be performed with the object. In particular, when the size of the grasp required to respond is matches that of the object, responses are faster than when they mismatch. According to grounded cognition theories, action potentiation is the result of the sensory-motor simulations that constitute conceptual knowledge of objects. On this account, activation of a concept such as a hammer involves simulating actions such as a full hand grip of the handle. Alternatively, the effect could be explained by task-specific stimulus-response compatibility. On this account, participants align dimensions of the stimulus and of the response, such as size. When

the dimensions are aligned, responses are faster than when they are not aligned, as in the Simon effect. In several experiments, we found that the presence of response competition and the relative rather than absolute size of stimuli could explain performance. This suggests that stimulus-response competition is a more likely explanation than sensory-motor simulations.

Speaker	Pezzulo, Giovanni
Author 1	Pezzulo, Giovanni National Research Council, Rome, Italy
Author 2	Barca, Laura National Research Council, Rome, Italy
Title	Tracking the dynamics of multi-attribute choices: examples from inter-temporal and effort-based decisions
Abstract	Many real life decisions have more than one dimension - for example, when choosing between two travel destinations, one can consider the beauty of the places, the price of the travels, and so on. Understanding how these attributes are considered, evaluated and weighted over time is still an open research question. We tracked the hand (mouse) kinematics of participants involved in two well-known multi-attribute choice paradigms: inter-temporal choices (in which subjects select between smaller-sooner vs. larger-delayed rewards) and effort-based decisions (in which subjects select between a smaller reward that requires no effort vs. a larger reward that requires some effort to be secured). Our hope was that looking at dynamical choice patterns in these tasks - specifically, measuring subject's mouse movements towards one of the two choice buttons - might "unveil" aspects of multi-attribute decisions that are more difficult to see if one only considers (say) reaction times. Indeed, we found interesting dynamical choice patterns and significant individual differences in the way subjects integrate choice attributes. For example, in inter-temporal decisions, "farsighted" subjects seem to have a strong initial bias towards pressing the "larger-delayed" button, which they sometimes correct on-line; while "discounters" show more choice uncertainty in their mouse trajectories, contrary to the idea that they are more impulsive. These results might help understanding they way multiple attributes are considered and integrated during a choice. By the same token, these results can help understanding how subjects discount the value of an offer depending on temporal delay and physical effort.

Speaker	Ramscar, Michael
Author 1	Ramscar, Michael Eberhard Karls Universität Tübingen

Title	The mismeasurement of mind: Why neuropsychological test results exaggerate "healthy cognitive decline."
Abstract	Performance on neuropsychological tests declines with age. This is taken as evidence that cognitive capacity declines across the lifespan, providing a functional characterization of structural change in the ageing brain However, neuropsychological tests do not control for accumulated learning, and thus ignore the impact that increased knowledge and expertise can have on task performance. Here, we examine the effect of formally controlling for these factors on what is considered one of the most reliable measures of lifespan cognitive decline, Paired Associate Learning (PAL). We find that age-related changes in PAL performance are entirely consistent with the predictions of the error-driven "associative learning" models that represent the gold standard in other areas of behavioral and neuroscientific research. A modeling simulation shows how the changes seen in PAL performance across the lifespan A simulation using a standard learning model shows that lifespan changes in PAL performance are consistent with increasing knowledge, and predicts that holding age constant while varying linguistic experience will produce the effects usually interpreted as age-related decline. Consistent with this, we show that in German PAL tests, older Chinese-German bilinguals outperform age-matched native German speakers, and this advantage increases with age. These results illustrate how neuropsychological tests inflate estimates of functional decline and distort our understanding of neurological change across the lifespan.

Speaker	Regenwetter, Michel
Author 1	Regenwetter, Michel University of Illinois at Urbana-Champaign
Author 2	Robinson, Maria University of Illinois at Urbana-Champaign

Title	The construct-behavior gap in behavioral decision research: A challenge beyond replicability
Abstract	Behavioral decision research compares theoretical constructs such as preferences to behavior such as observed choices. Three common methods for connecting constructs to behavior are 1) to count the total number of choices of a certain kind across participants and decision problems, 2) to compare what most people choose in each decision problem against a predicted pairwise preference, or, 3) to enumerate the decision problems in which two experimental conditions generate a one- sided significant difference in choice frequency. While simple, these methods are heuristics. They are subject to well-known reasoning fallacies, most notably the fallacy of sweeping generalization and the fallacy of composition. No amount of replication can alleviate these fallacies. The remedy to these very

common problems lies in spelling out precise theories of how hypothetical constructs translate into behavior, not in successful replication of hard to interpret effects.

Speaker	Rehder, Bob
Author 1	Rehder, Bob New York University
Title	Beyond Markov: The Beta-Q Model of Causal Reasoning
Abstract	Although many theories of causal cognition are based on causal graphical models, a defining property of such models—the independence relations stipulated by the Markov condition—is routinely violated by human reasoners. Three accounts of why people violate independence are formalized and subjected to experimental test. Subjects' inferences were consistent with a model that stipulates that humans interpret causal networks as implying patterns of co-occurrence among variables that are different than those stipulated by the normative model.

Speaker	Sanborn, Adam
Author 1	Sanborn, Adam University of Warwick
Author 2	Tripp, James University of Warwick
Author 3	Stewart, Neil University of Warwick
Author 4	Noguchi, Takao University College London
Title	Most people are normative some of the time: Mixtures of combination rules are used in estimates of conjunctions and disjunctions
Abstract	Human estimates of the probabilities of combinations of events show well-established violations of probability theory, most notably the conjunction and disjunction fallacies. These violations have led researchers to conclude that the rules of probability are too complex for most people to use, and that cognitively easier approximations such as averaging are used instead. However, previous work has either looked at data averaged over participants or has assumed that individuals use only a single combination rule. We collected repeated estimates of conjunctions and disjunctions and investigated whether individuals consistently used a single rule or used a

repertoire of rules using a trial-by-trial Bayesian analysis. We found that most participants were best described as randomly selecting a combination rule on each trial, and that a large majority of participants use the correct rule at least some of the time.

Speaker	Shiffrin, Richard
Author 1	Shiffrin, Richard Indiana University
Author 2	Nosofsky, Robert Indiana University
Author 3	Cao, Rui Indiana University
Title	Learning in short-term memory scanning
Abstract	Short-term memory search does not occur in isolation but involves retrieval from long-term memory, not only due to encoding the test stimulus, but also due to learning that can occur over just a few trials. We investigate the way learning depends on consistency of stimulus and response mappings from one trial to the next, and what is learned: item-response mappings, or category-response mappings. We show that item-response mappings can be learned and used if consistent for just a few trials. Category response mappings can be learned and used but only after a great deal of learning over many trials. Inconsistency prevents learning if mappings change from trial to trial, but not if changes occur every ten trials. We demonstrate how 'switch costs' harm performance.

Speaker	Simen, Patrick
Author 1	Simen, Patrick Oberlin College, Department of Neuroscience
Title	Robust time scale invariance in timing and perceptual decision making
Abstract	Response times (RTs) in two-choice perceptual decision making tend to be time scale invariant: when you divide the RTs in different task conditions by their means, the resulting, normalized RT distributions tend to overlap. This also occurs in interval timing tasks, in which participants decide when to make a pre-ordained response after a cue. Differences in average RTs across conditions in such tasks can span orders of magnitude, but time scale invariance appears robust here. Typically parameterized random walk models of decision making, however, can only approximate time-scale invariance across decision making task conditions. Classic models of interval timing fail more spectacularly to account naturally for observed, behavioral

invariances. Yet robust timescale invariance is produced by accumulator models of timing when they are generalized in precisely the same way as the well-known diffusion decision model has been generalized, in order to explain unequal correct and error RT means in perceptual decision making (the restricted model, in contrast, predicts equality when there is no response bias). I will review the parallels between the models and the behavioral phenomena of these two fields of research, and show how laws of behavior in both domains are explained by some simple parameterizations of classic diffusion models. I will also address a potentially central role of reward in parameterizing these models, and some behavioral evidence that supports a role for reward rate in adaptive behavior in decision and timing tasks.

Speaker	Sloutsky, Vladimir
Author 1	Sloutsky, Vladimir Ohio State University
Title	The Development of Categorization: Evidence from Category Learning and Recognition Memory
Abstract	What is the mechanism of categorization and how does it change with development? To answer these questions, we conducted category learning experiments with 4- and 6-year-olds and adults. In all experiments, participants learned categories and then were tested with categorization and recognition tasks. In Experiments 1 participants ably learned the categories, and representational differences transpired between children and adults: adults exhibited better memory for most predictive features, whereas young children remembered well all the features. In Experiment 2, participants' attention was explicitly directed to the most predictive feature, and in Experiment 3, their attention was directed to the less predictive features. Adults' remembered features differentially, according to instructions, whereas young children remembered all the features equally well. Furthermore, their memory for features that were not cued was better than memory for these features in adults. Results of computational modeling indicate that whereas categorization decision in adults are predicted by their representations of the category, in children categorization decision and representations were independent. These results suggest important developmental differences in attention and representation of categories.

Speaker	Speekenbrink, Maarten
Author 1	Speekenbrink, Maarten University College London
Author 2	Schulz, Eric University College London

Title	Decisions in context: Exploration and exploitation in contextual multi-armed bandits
Abstract	Contextual multi-armed bandits (CMABs) are a general framework to study how people make decisions from experience. In a CMAB, an agent is faced with a number of options (arms of the bandit) to choose from. At each time, there is a stochastic reward associated to each arm, which depends (partly) on a set of observable features (the context). The task is to maximise the reward obtained over repeated choices by learning about the reward distributions and how they relate to the contextual features. CMABs involve an interesting exploration-exploitation trade-off, as it is good to sometimes choose an option not because it is expected to give a good reward, but because it is highly informative about the relation between context and rewards. I will describe our recent theoretical and empirical work on how people solve CMAB tasks, using Gaussian Processes to represent the current knowledge about the context-rewards relations, and a variety of acquisition functions which determine how this knowledge is used to make decisions.

Speaker	Sperling, George
Author 1	Sun, Peng New York UNiversity
Author 2	Chubb, Charles University of California, Irvine
Author 3	Wright, Charles University of California Irvine
Author 4	Sperling, George University of California, Irvine

Title	Attention filters for features. New results.
Abstract	This abstract is a place holder for a presentation of our most recent findings on feature attention. An attention filter is a brain process, initiated by a participant in the context of a task requiring feature-based attention, that operates broadly across space to modulate the relative effectiveness with which different features in the retinal input influence performance. The method for quantitatively measuring attention filters uses a ``statistical summary representation'' (SSR) task in which the participant strives to mouse-click the centroid of a briefly flashed cloud composed of items of different types (e.g., dots of different luminances or sizes), weighting some types of items more strongly than others. In different attention conditions, the target weights for different item-types in the centroid task are varied. The actual weights exerted on the participant's

responses by different item-types in any given attention condition are derived by simple linear regression. Because, on each trial, the centroid paradigm obtains information about the relative effectiveness of all the features in the display, both target and distractor features, and because the participant's response is a continuous variable in each of two dimensions (versus a simple binary choice as in most previous paradigms), it is remarkably powerful. We describe (1) algebraic derivations for three useful statistics to describe attention filters: efficiency, fidelity, and data driveness, (2) confidence bounds on these statistics, and (3) some important procedural improvements: singleton trials, constant dispersion. Illustrative examples will be shown as time permits.

Speaker	Steil, Jochen
Author 1	Steil, Jochen Bielefeld University bielefeld.de
Title	Scaling exploratory robot learning from motor to social learning
Abstract	There is a long-standing and ongoing discussion on the role of forward and inverse models in motor control and beyond. Bridging robotics and cognitive science, the talk discusses the relevance and implications of recent advancements in exploratory robot learning, summarized under the term Goal Babbling, for social and cognitive learning. Whereas Goal babbling is motivated by the early infants' capability to reach for goals, a respective computational model to explore task spaces directly without previous motor babbling has been very successfully deployed in robotics, as will be shown by examples. Motivated from this development, the talk subscribes to the notion that learning models of others is primarily a task of acquisition of an inverse model. While this is difficult to learn in general, the talk speculates that a suitable transfer of Goal Babbling ideas provides a new approach towards learning theory-of-mind and self-other distinctions in a radically interaction-centred way.

Speaker	Stoianov, Ivilin Peev
Author 1	Stoianov, Ivilin Peev Aix-Marseile University and CNRS
Author 2	Ziegler, Johannes Aix-Marseile University and CNRS
Author 3	Grainger, Jonathan Aix-Marseile University and CNRS
Title	The perceptual code in reading: explaining the spatial variance and invariance with a neurocomputational model of visual word

	perception
Abstract	Using a neurocomputational approach, we investigated the mechanism of visual word perception and more specifically, the highly disputable letter-position coding scheme that still lacks an adequate neural-level account. We combined a deep generative network to learn the visual perceptual hierarchy in reading and a linear map to extract the abstract letter identities from the emergent perceptual code and infer then word identity. To account for the ample availability of perceptual data and the limited evidence for word identity, we trained the generative network with unsupervised learning on a large dataset of images of words with variable features and locations and then trained the abstract letter detectors on a much smaller dataset. Surprisingly, the generative model developed hierarchical detectors of letter shapes at multiple retinal locations but no detectors of chunks of letters. Despite of that, the visual features in the deepest layer provided an adequate support for location-invariant extraction of letter- and word-identity. Moreover, imperfections in the perceptual processing provided plausible neural-level account of various phenomena characterizing position coding, including the so-called "letter-transposition effect" in the perceptual matching task. Altogether, our model provides a plausible computational hypothesis for the mechanism of visual word perception that could help to explain multiple phenomena in reading at the neural level.

Speaker	Talmi, Deborah
Author 1	Talmi, Deborah University of Manchester
Title	Modelling the list composition effect on emotional memory
Abstract	Free recall of emotional pictures is better than free recall of neutral pictures, but only when these two types of pictures are presented in mixed lists. Free recall of emotional pictures is equivalent to that of neutral pictures in pure lists, which contain either emotional or neutral pictures. This talk will explore how this effect of list composition can be accommodated within existing models of memory. Emotional pictures could be considered 'strong' items, because they are processed for longer, and trigger deeper semantic analysis. This kind of strength is, however, different from the strength that is thought to underlie the list-strength effect; and a number of findings with word stimuli, and when the task is performed under divided attention, go against the list-strength interpretation of this effect. Therefore, accommodating this effect within SAM or REM is not trivial. Emotional pictures are more distinct relative to other items stored in memory, so the effect could stem from relative distinctiveness at retrieval. Yet the specific pattern of findings, where the effect is driven by a drop in neutral memory in mixed lists appears to go against the predictions of SIMPLE.

Emotional pictures are likely associated with stronger prediction error and surprise when they are encoded, regardless of the context, so predictive coding models also cannot account for the list composition effect without additional assumptions. The list-composition effect on emotional memory is robust, but is currently not explained well by existing memory models.

Speaker	Testolin, Alberto
Author 1	Testolin, Alberto University of Padova
Author 2	Stoianov, Ivilin Aix-Marseille Université
Author 3	Zorzi, Marco University of Padova
Title	Letter perception emerges in deep neural networks from unsupervised learning and recycling of natural image statistics
Abstract	Letter perception is the visual front-end of reading, a key human ability and a major achievement of cultural evolution. Processing of visual symbols is thought to emerge through learning and recycling of pre-existing neuronal networks for visual object recognition. We tested this hypothesis in a large-scale computational model of letter perception based on deep neural networks. In line with neuroimaging and neurophysiological evidence, our model relies on a hierarchy of increasingly more complex internal representations, which emerge through unsupervised learning by fitting a probabilistic generative model to the sensory input. Earlier processing levels recycle domain-general visual features learned from natural image patches, while domain-specific feature detectors emerge in upstream neurons following exposure to letters presented as real images in a variety of fonts and styles. We show that visual primitives extracted from natural scenes can be effectively reused for letter perception, thereby supporting the hypothesis that the shape of visual symbols has been culturally selected to match the type of statistical structure found in our environment. Crucially, abstract representations emerging from deep unsupervised learning can be easily mapped to corresponding letter identities by linear read-out, which supports robust letter recognition in high-noise conditions and produces accurate simulations of psychophysical data.

Speaker	Trcek, Denis
Author 1	Trcek, Denis University of Ljubljana lj.si
Title	CAN COMPUTATIONAL TRUST MODELS EVALUATION HELP

US TO ATTRIBUTE TRUST TO SPECIFIC PARTS OF A NERVOUS SYSTEM?

Abstract	Research on formal models for trust (and computational trust management in general) is close to its deployment in global digital ecosystems. But this kind of research, which is going on now for over twenty years, has produced a plethora of models so far. Therefore the scientific community is facing the following key questions: How can one compare these models, what metrics can be used, and how they can be effectively evaluated in terms of better or worse performance? Certain testbeds have been developed in the community to solve these questions, but with notable shortcomings. They typically evaluate trust models by combining them with some ad hoc decision making mechanism and then evaluate the quality of trust-based decisions. They assume that if using the same decision making mechanism then this very mechanism becomes irrelevant for such evaluation. We claim, however, that the choice of decision making mechanism is very relevant. To test our claim we have built an open source test-bed, called Alpha Agent testbed that can evaluate trust models either with or without decision making mechanism and rank them accordingly. But this is still just the basis for the core question – assuming a quite good understanding of what trust is and its relationship to decision making, are we able to attribute it as specifically as possible to certain areas of a nervous system?

Speaker	Trueblood, Jennifer
Author 1	Trueblood, Jennifer Vanderbilt University
Author 2	Yearsley, James Vanderbilt University
Author 3	Pothos, Emmanuel City University London

Title	When are causal representations quantum versus classical?

Abstract	Decades of research has shown that human decision-making often violates the rules of classical probability theory. Quantum probability theory provides an exciting new framework to model human behavior. In this talk, I will compare quantum and classical probability models of human causal reasoning. We adapted a paradigm from Rehder and Hastie (2001) where participants made judgments about a simple causal scenario involving novel categories. They also completed the Cognitive Reflection Task (CRT), a simple measure of cognitive ability that distinguishes between effortful, reflective processes and those that are executed more quickly with little conscious deliberation. A Bayesian analysis revealed that participants who tended to engage quick, intuitive cognitive

processes, as measured by the CRT, were better described by a quantum model. Participants that tended to engage effortful, reflective processes were better described by a classical model. Further, participants' judgments changed through the course of the experiment as they gained more experience with the task. By the end of the experiment, all participants were better described by a classical model. This suggests that learning and experience help people form a classical representation of information.

Speaker	Usher, Marius
Author 1	Usher, Marius Tel-Aviv University
Author 2	Tsestos, Konstantinos Birkbeck College, University of London
Author 3	Summerfield, Chris University of Oxford
Author 4	Chater, Nick University of Warick
Author 5	Moran, Rani Tel-Aviv University
Title	Selective-integration: a decision mechanism that accounts for violations of transitivy and of the independence axiom (decoy effects)
Abstract	Transitivity and the independence on irrelevant alternatives are two of the central principles of rational decision making. While people are thought to be adaptive in their perceptual decisions, research in multi-attribute decision-making has revealed both types of violations. Here we show that a selective-integration model, which assumes that values are integrated subject to ranks, can account for both findings. Moreover, the model provides an account for why such a "selective-integration" may be in place: to protect the decision mechanism from late noise.

Speaker	van Ravenzwaaij, Don
Author 1	Van Ravenzwaaij, Don University of Groningen
Author 2	Donkin, Chris University of New South Wales
Author 3	Vandekerckhove, Joachim University of California Irvine
Title	The EZ Diffusion Model Provides a Powerful Test of Simple

	Empirical Effects
Abstract	Over the last four decades, sequential accumulation models for choice response times have spread through cognitive psychology like wildfire. The most popular style of accumulator model is the diffusion model (Ratcliff, 1978), which has been shown to account for data from a wide range of paradigms, including perceptual discrimination, letter identification, lexical decision, recognition memory, and signal detection. Since its original inception, the model has become increasingly complex in order to account for subtle, but reliable, data patterns. The additional complexity of the diffusion model renders it a tool that is only for experts. In response, Wagenmakers, van der Maas, and Grasman (2007) proposed that researchers could use a more basic version of the diffusion model, the EZ diffusion. Here, we simulate experimental effects on data generated from the full diffusion model and compare the full diffusion model and EZ diffusion on their power. We show that the EZ diffusion model, by virtue of its relative simplicity, is better able to detect experimental effects than the data–generating full diffusion model.

Speaker	Walasek, Lukasz
Author 1	Walasek, Lukasz University of Warwick
Author 2	Brown, Gordon University of Warwick

Title	Income Inequality and Positional Consumption Online
Abstract	How does income inequality affect our concern with social status? According to a social rank hypothesis, greater concern with "keeping up with the Joneses" may be a rational response to higher income inequality. Consequently, consumers who live in regions with higher income inequality will show greater concern with, and attention towards, positional goods and high-status brands that serve a social signalling role. We tested this account using Google Correlate and Google Trends to find internet search terms that correlate (both positively and negatively) with income inequality within the US and cross-nationally. Findings were consistent with the social rank hypothesis, showing that in more unequal regions people devote more of their resources (here, time searching the web) researching high status goods such as expensive watches or luxury perfumes. We replicated these results examining Twitter, where we find that online posts about (e.g.) Prada, Gucci or Rolex are more prevalent in more unequal US states. Using sentiment analysis, we show that the positivity with which high and low status brands are mentioned on Twitter does not differ as a function of income inequality. Finally, we demonstrate that the within-nation relationship between inequality and positional consumption is unlikely to be driven by

the spending tendencies of the wealthiest members of a society. We conclude with a proposal for a psychological model that links individual perception of income and wealth distribution to a range of behaviours that are critical for maintaining well-being of a person and a society as a whole.

Speaker	Yearsley, James
Author 1	Yearsley, James Vanderbilt University
Author 2	Trueblood, Jennifer Vanderbilt University
Title	Quantum and Classical Models of Causal Reasoning for Political Judgments
Abstract	Reasoning about the causal relationships between events is an important component of cognition, allowing us to make sense of the world. Arguably, the most successful models of causal reasoning, Causal Graphical Models (CGMs), perform well in some situations, but there is considerable variation in how well they are able to account for data, both across scenarios and between individuals. Phenomena such as order effects in predictive judgments and conjunction fallacies in judgments about causes and effects cannot be accounted for by CGMs. We propose a model of causal reasoning based on quantum probability (QP) theory that accounts for behavior in situations where CGMs fail. Whether QP or classical models are appropriate depends on the representation of events constructed by the reasoner. We describe a large (N=1200) experiment conducted during the US Presidential primaries involving judgments about the outcomes of primaries and the eventual nominations. Robust order effects and conjunction fallacies were observed, but there was considerable variation in behavior across participants and candidates. This suggests that the representation of events used to reason about the world can vary between people and from task to task.

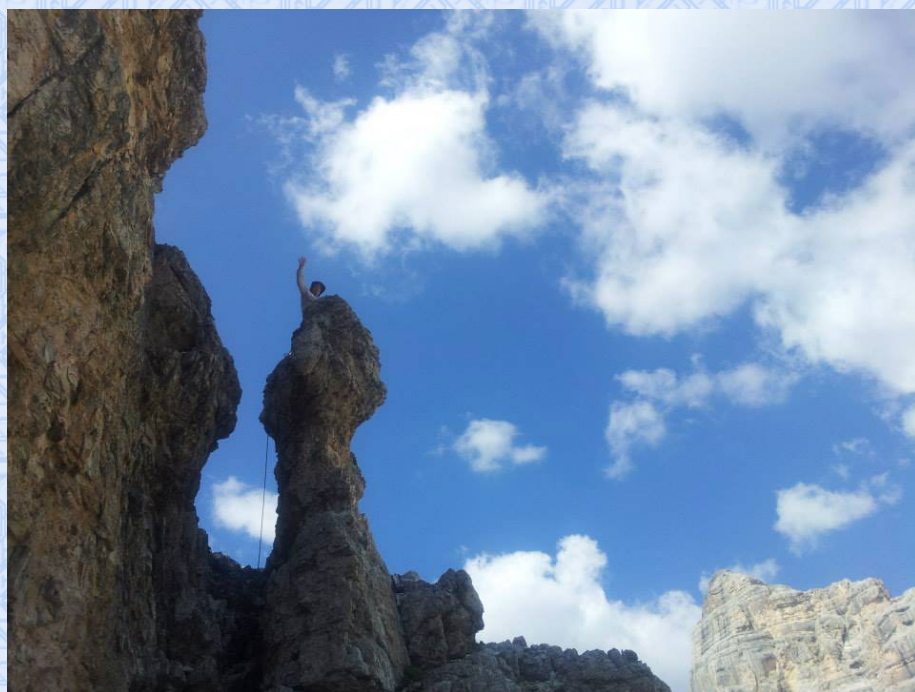| Speaker	Ziegler, Johannes
Author 1	Ziegler, Johannes Aix-Marseile University and CNRS
Author 2	Perry, Conrad Swinburne University of Technology
Author 3	Zorzi, Marco Università di Padova

Title	Predicting Individual Dyslexia Patterns And Intervention Strategies Through Computational Modelling
Abstract	Learning to read in alphabetic languages relies on two core mechanisms: phonological decoding and self-teaching. Here, we present the first full-blown developmentally plausible computational model of reading acquisition that implements these two mechanisms. It was used to simulate developmental trajectories of 622 children (388 dyslexics). We show that individual reading performance on words and nonwords can be simulated with high accuracy on the basis of their underlying deficits in subcomponents of the reading network. Such simulations make it possible to predict for any given child how remediating one or several subcomponents should improve reading of words and nonwords. We further show that common single-deficit theories are unable to account for the observed heterogeneity in reading performance. We thus advocate a novel multi-factorial computational approach of understanding reading and dyslexia, which has concrete practical implications for intervention.

Speaker	Zorzi, Marco
Author 1	Zorzi, Marco University of Padova
Title	The effect of attentional load on visuospatial processing in normal and damaged brains
Abstract	Spatial awareness depends on the complex interplay between spatial and non-spatial cognitive processes. I will review studies from my lab that investigated the effect of multitasking on spatial monitoring using a variety of methods and subject populations (healthy individuals and patients with brain damage). Our studies show that i) spatial awareness in stroke patients can be dramatically and asymmetrically hampered by multitasking, even when patients do not show any deficit in classic neuropsychological testing; ii) a spatial awareness deficit is induced in patients with left hemisphere stroke, a population in which spatial deficits are thought to be uncommon; iii) in healthy individuals, increased attentional load during multitasking is psychophysiologically reflected by increasing pupil dilation (eye-tracking data) and early suppression of visual areas (ERP data). In summary, our multitasking approach mimics complex everyday life requirements, maximally triggers competitive mechanisms, and selectively exacerbates contralesional spatial deficits after brain damage.

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