

INTERNATIONAL WORKSHOP ON ACTIVE INFERENCE

OCTOBER 15, 16 & 17, 2025

New Residence Hall, McGill University 3625 Park Ave, Montreal, Quebec H2X 3P8

# **ACKNOWLEDGEMENTS**

# **IWAI 2025** IS MADE POSSIBLE THANKS TO THE FOLLOWING PEOPLE

### **GENERAL CHAIRS**

DR. DAVID BENRIMOH - DAVID.BENRIMOH@MAIL.MCGILL.CA DR. MAHAULT ALBARRACIN - MAHAULT.ALBARRACIN@VERSES.AI

# **TECHNICAL PROGRAM CHAIRS**

IVILIN PEEV STOIANOV - IVILINPEEV.STOIANOV@CNR.IT **VICE-CHAIR**: MARTIJN WISSE - M.WISSE@TUDELFT.NL

### ADVANCEMENT CHAIR

SUSIE KIM - SUSIE.KIM@VERSES.AI

# **IWAI 2025** IS GENEROUSLY SUPPORTED BY THE FOLLOWING SPONSORS





**IWAI 2025** COMMUNITY PARTNER



**IWAI 2025** MEDIA PARTNER



# **IWAI ORGANIZATION COMMITTEE**

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NATIONAL RESEARCH COUNCIL (CNR), ITALY

TIM VERBELEN, VERSES, USA

MARTIJN WISSE, DELFT UNIVERSITY OF TECHNOLOGY, NETHERLANDS

# **WELCOME TO IWAI 2025!**

We are thrilled to welcome you to Montreal for the first ever North American edition of IWAI. We have prepared a fantastic ensemble of speakers ranging from the theoretical to the applied, in fields ranging from machine learning to robotics to computational psychiatry. This diversity speaks to the burgeoning growth of our field and its potential to serve as a general theory of information processing that can underlie significant advancements across the range of human undertaking.

We are also very excited to welcome you to Montreal - a city known as much for its expertise in neuroscience, artificial intelligence as for the liveliness of its nightlife and foodie scene. While we have a packed schedule laid out for you, we hope you get some time to explore the historic McGill campus, try poutine, and feast on some Montreal bagels.

Active Inference is at a critical crossroads. As the hype around generative AI runs into the fundamental limitations of the technology, new approaches such as Active Inference will be increasingly relevant on the global stage in the quest for new intelligent systems adapted to solving our greatest challenges. At the same time our community is still a close one- at IWAI, you can still meet, speak to, and connect with even the most senior thinkers in Active Inference. Take this opportunity - build connections, foster friendships and collaborations, and let's prepare for what comes next together!

Welcome to Montreal and to IWAI 2025!

David Benrimoh, MD.CM., MSc., MSc., FRCPC Mahault Albarracin, PhD IWAI 2025 Chairs

# **INVITED SPEAKERS**

OPENING KEYNOTE	Chris Mathys
KEYNOTES	Glen Berseth Karl Friston Dalton Sakthivadival Jun Tani
SOCIAL SCIENCE PANEL	Axel Constant Ines Hipolito Ben White
TUTORIAL ON ACTIVE INFERENCE	Ryan Smith
FIRESIDE CHAT AND COCKTAIL	Anna Ciaunica Karl Friston Chris Mathys

# **LOCATIONS**

Main Stage, Poster Room, Lunch New Residence Hall, McGill University 3625 Park Ave, Montreal, Quebec H2X 3P8

Fireside Chat & Cocktail
McGill Faculty Club, McGill University
3450 McTavish St, Montreal, Quebec H3A 1X9

Gala Dinner NOMAD 129 avenue Van Horne, Montréal, QC, H2T 2J2





15

**OCTOBER** 

8.00

# **REGISTRATION & BREAKFAST**

**NEW RESIDENCE HALL, LOBBY** 

9.00

# OPENING REMARKS

DR. DAVID BENRIMOH AND DR. MAHAULT ALBARRACIN NEW RESIDENCE HALL, MAIN STAGE

9.10

# **ACTIVE INFERENCE TUTORIAL**

DR. RYAN SMITH

NEW RESIDENCE HALL, MAIN STAGE

11.10

# **BREAK**

**NEW RESIDENCE HALL, LOBBY** 

11.20

# CURRENT PROGRESS IN EMPIRICAL APPLICATIONS OF ACTIVE INFERENCE IN COMPUTATIONAL PSYCHIATRY

DR. RYAN SMITH

**NEW RESIDENCE HALL, MAIN STAGE** 

12.20

# **LUNCH**

**NEW RESIDENCE HALL, LOBBY** 

13.20

# **CONTRIBUTED TALKS 1**

MODELS OF DECISION MAKING

**WAYMO** 

# **POSTER SPOTLIGHTS 1**

NEW RESIDENCE HALL, MAIN STAGE

14.30

**BREAK** MADE POSSIBLE WITH THE SUPPORT OF WAYMO

NEW RESIDENCE HALL, LOBBY

15.00

# **OPENING KEYNOTE**

# WHAT ARE WE UP AGAINST IN ACTIVE INFERENCE?

DR. CHRIS MATHYS

NEW RESIDENCE HALL, MAIN STAGE

16.00

# **POSTER SPOTLIGHTS 2**

NEW RESIDENCE HALL, MAIN STAGE

16.30

# **POSTER SESSION 1**

**NEW RESIDENCE HALL - POSTER ROOM** 

18.30

# FIRESIDE CHAT & COCKTAIL

DRS. A. CIAUNICA, K. FRISTON, C. MATHYS, & R. SMITH MCGILL FACULTY CLUB

# PROGRAM SCHEDUL

**OCTOBER** 

# 8.00 **REGISTRATION & BREAKFAST**

9.00

**INVITED TALKS** 

# REMARKS ON THE MATHEMATICS OF THE FREE ENERGY PRINCIPLE

DR. DALTON SAKTHIVADIVEL NEW RESIDENCE HALL, MAIN STAGE

NEW RESIDENCE HALL, LOBBY

10.00

# **CONTRIBUTED TALKS 2**

FORNEY STYLE FACTOR GRAPHS

### POSTER SPOTLIGHTS 3

NEW RESIDENCE HALL, MAIN STAGE

11.00

# **BREAK**

**NEW RESIDENCE HALL, LOBBY** 

11.15

# **CONTRIBUTED TALKS 3**

FUNDAMENTAL ACTIVE INFERENCE EXTENSIONS

### POSTER SPOTLIGHTS 4

**NEW RESIDENCE HALL, MAIN STAGE** 

12.15

### LUNCH

NEW RESIDENCE HALL, LOBBY

13.15

# **CONTRIBUTED TALKS 4**

SIMULATIONS OF MENTAL PROCESSES

### POSTER SPOTLIGHTS 5

NEW RESIDENCE HALL, MAIN STAGE

14.15

# SOCIAL SCIENCE PANEL PROUDLY SPONSORED BY VERSES

DRS. A CONSTANT, B WHITE, I HIPOLITO NEW RESIDENCE HALL, MAIN STAGE

15.15

**BREAK** MADE POSSIBLE WITH THE SUPPORT OF **NOUMENAL** 

**NEW RESIDENCE HALL, LOBBY** 

15.45

# **CONTRIBUTED TALKS 5**

**HUMAN EXPERIMENTS** 

**NOUMENAL** 

# **POSTER SPOTLIGHTS 6**

NEW RESIDENCE HALL, MAIN STAGE

16.55

# **POSTER SESSION 2**

**NEW RESIDENCE HALL - POSTER ROOM** 

19.00

GALA DINNER TICKETS PURCHASED SEPARATELY

NOMAD, 129 AVENUE VAN HORNE, MONTRÉAL, QC, H2T 2J2



**OCTOBER** 

8.00

# **REGISTRATION & BREAKFAST**

**NEW RESIDENCE HALL, LOBBY** 

8.50

**INVITED TALKS** 

COGNITIVE NEUROROBOTICS STUDIES EXTENDING THE FREE ENERGY PRINCIPLE

DR. JUN TANI, NEW RESIDENCE HALL, MAIN STAGE

9.50

# FIRESIDE CHAT, 'THE FUTURE OF AI'

DRS. GARY MARCUS & KARL FRISTON, MODERATED BY TIM VERBELEN NEW RESIDENCE HALL, MAIN STAGE

10.30

**BREAK** 

NEW RESIDENCE HALL, LOBBY

10.45

**CONTRIBUTED TALKS 6** 

SCALING AND EFFICIENCY

POSTER SPOTLIGHTS 7

NEW RESIDENCE HALL, MAIN STAGE

11.45

**CONTRIBUTED TALKS 7** 

**ROBOTICS** 

**POSTER SPOTLIGHTS 8** 

NEW RESIDENCE HALL, MAIN STAGE

12.45

LUNCH

NEW RESIDENCE HALL, LOBBY

13.45

**CONTRIBUTED TALKS 8** 

THEORY OF MIND/MULTI-AGENT

**VERSES** 

**POSTER SPOTLIGHTS 9** 

NEW RESIDENCE HALL, MAIN STAGE

14.45

INVITED TALK

MILA TALK DR. GLEN BERSETH , NEW RESIDENCE HALL, MAIN STAGE

15.40

**POSTER SESSION 3** 

NEW RESIDENCE HALL, POSTER ROOM

16.30

**BREAK** MADE POSSIBLE WITH THE SUPPORT OF **VERSES** 

**NEW RESIDENCE HALL, LOBBY** 

17.00

**CLOSING KEYNOTE** 

ACTIVE INFERENCE, LEARNING AND SELECTION

DR. KARL FRISTON, NEW RESIDENCE HALL, MAIN STAGE

18.00

**AWARDS AND CLOSING REMARKS** 

DR. DAVID BENRIMOH AND DR. MAHAULT ALBARRACIN NEW RESIDENCE HALL, MAIN STAGE

October 15, 2025

13.20

# **CONTRIBUTED TALKS 1 - MODELS OF DECISION MAKING**

On the Variational Costs of Changing Our Minds

David Hyland; Mahault Albarracin

Cognitive Effort in the Two-Step Task: An Active Inference Drift-Diffusion Model Approach

Álvaro Garrido Pérez; Viktor Lemoine; Amrapali Pednekar; Yara Khaluf;

Pieter Simoens

Addressing the Subsumption Thesis: A Formal Bridge between Microeconomics and Active Inference

Noé Romeo Kuhn

Contributed Talk, Sponsor: WAYMO

October 16, 2025

# 10.00

# **CONTRIBUTED TALKS 2- FORNEY STYLE FACTOR GRAPHS**

Bethe Predictive Coding

Magnus Koudahl; Tommaso Salvatori;

Lancelot Da Costa; Jeff Beck;

Alexander Tschantz; Christopher L Buckley;

Hampus Linander

A Message Passing Realization of Expected Free Energy

Minimization

Wouter W. L. Nuijten; Mykola Lukashchuk;

Thijs van de Laar; Bert de Vries

**Spike-Timing-Dependent Plasticity for Bernoulli** 

Message Passing

Sepideh Adamiat; Wouter M. Kouw; Bert de

Vries

October 16, 2025

# 11.15

# **CONTRIBUTED TALKS 3 - FUNDAMENTAL ACTIVE INFERENCE EXTENSIONS**

Diffusion-Generated Latent Spaces for Continuous Amortized Active Inference Agents: A Mathematical Framework Zahra Sheikhbahaee; Adam Safron; Dalton A R Sakthivadivel;

Mahault Albarracin; Irina Rish

Deep Active Inference with Neural Stochastic Differential Equations

Marc Pritsch; Georgia Koppe

A Diffusion Prior for Active Inference Planning

Catherine F. Higham

# 13.15

# **CONTRIBUTED TALKS 4 - SIMULATIONS OF MENTAL PROCESSES**

An Active Inference Model of Covert and Overt Visual Attention

Tin Mišić; Karlo Koledić; Fabio Bonsignorio; Ivan Petrovic:

Ivan Marković

Dynamic Attentional Agents in Focused Attention Meditation: Hierarchical Computational Modeling of Expert-Novice Differences

Prakash Chandra Kavi; Daniel Ari Friedman;

Gustavo Patow

Geometric Hyperscanning under Active Inference

Nicolás Andrés Hinrichs; Mahault Albarracin;

Dimitris Bolis; Yuyue Jiang; Leonardo

Christov-Moore; Leonhard Schilbach

# October 16, 2025

# 15.45

# **CONTRIBUTED TALKS 5 - HUMAN EXPERIMENTS**

An Active Inference Model of Mouse Point-and-Click Behaviour Markus Klar; Sebastian Stein; Fraser Carlylr Paterson; John H. Williamson; Roderick Murray-Smith

Writing through Sympathetic Arousal: A
Perceptual Active Inference Model of on the
Effects of Sympathetic Arousal Interoception on
Written and Spoken Grammatical Complexity

Aleksandra, B. Skelton; Lukas A. De Vries; Angelica M. Silva; Roberto Limongi

**Evaluation of "As-Intended" Vehicle Dynamics using the Active Inference Framework** 

Kazuharu Kidera; Takuma Miyaguchi; Hideyoshi Yanagisawa

Contributed Talk, Sponsor: NOUMENAL

October 17, 2025

# 10.00

# CONTRIBUTED TALKS 6 - SCALING AND EFFICIENCY

Message passing-based inference in an autoregressive active inference agent

Wouter M. Kouw; Tim N. Nisslbeck; Wouter W. L. Nuijten

Multi-dimensional Autoscaling of Processing Services: A Comparison of Agent-based Methods

Boris Sedlak; Alireza Furutanpey; Zihang Wang; Victor Casamayor Pujol; Schahram Dustdar

Predictive Coding-based Deep Neural Network Finetuning for Computationally Efficient Domain Adaptation Matteo Cardoni; Sam Leroux

October 17, 2025

11.15

**CONTRIBUTED TALKS 7 - ROBOTICS** 

Navigation and Exploration with Active Inference:

from Biology to Industry

Daria de Tinguy; Tim Verbelen;

Bart Dhoedt

Free-Gate: Planning, Control And Policy Composition Via Free Energy Gating

Francesca Rossi; Émiland Garrabé; Giovanni

Russo

Mobile Manipulation with Active Inference for Long-Horizon Rearrangement Tasks

Corrado Pezzato; Ozan Catal; Toon Van de Maele; Riddhi J. Pitliya; Tim Verbelen

# 13.15 CONTRIBUTED TALKS 8 - THEORY OF MIND/MULTI-AGENT

Theory of Mind Using Active Inference: A Framework for Multi-Agent Cooperation

Riddhi J. Pitliya; Ozan Catal; Toon Van de

Maele; Corrado Pezzato;

Tim Verbelen

Demonstration of Making Humans Recognize Intentions of Robot Actions through Active Inference

Kanako Esaki; Yasuyuki Kudo; Tadayuki Matsumura; Takeshi Kato; Misa Owa; Junichi

Miyakoshi; Yasuhiro Asa;

Yang Shao; Ryuji Mine; Hiroyuki Mizuno

Navigating Uncertainties with Active Inference and Probabilistic Diffusion

Yufei Huang; Yulin Li; Andrea Matta; Mohsen a jafari

Contributed Talk, Sponsor: VERSES

# POSTER SESSION INSTALLATION

PRESENTED POSTERS MUST BE INSTALLED AT THE BEGINNING OF THE DAY OF THEIR SPOTLIGHT AND REMOVED AT THE END OF THAT DAY'S POSTER SESSION.

THERE WILL BE 10 POSTER STATIONS AVAILABLE PER SESSION (MAXIMUM 20 POSTERS), WITH EACH PRESENTER USING ONE SIDE. POSTERS ARE PLACED ON A FIRST-COME, FIRST-SERVED BASIS; NO ASSIGNED SPOTS WILL BE PROVIDED.

# October 15, 2025

# **POSTER SPOTLIGHTS 1**

Reframing the lived experience of persistent	Marc A Broberg; Mick Thacker;
dizziness: insights from active inference	Jorge E Esteves

No Way Out: Understanding Freeze Response in	Yaqi S. Zhang; Anna Pereira
Trauma through Active Inference	

Do Ambidextrous Organizations Minimize Free	Mikko Järvinen
Energy?	

Morals and Reasoning: Formalizing Moral	Albert Olweny Okiri
Influence on Reasoning and AI Systems Alignment	

Are clinical diagnoses regimes of attention under	Dr David M Foreman; Gabbay Dov
active inference?	,

# October 15, 2025

# **POSTER SPOTLIGHTS 2**

From Theory to Clinical Application: Aligning Active Inference Complexity with Behavioural Task Design in Suicidality Research

Pamina Laessing; Andreea Diaconescu; Peter Dayan

Psilocybin for treatment-resistant depression in autism: an active-inference model of improved cognitive flexibility

Peter Bedford; Povilas Karvelis; Andreea Diaconescu

The Role of Affective States in the Development of Psychotic Symptoms

David Benrimoh; Ryan Smith; Andreea O Diaconescu; Timothy Friesen; Sara Jalali; Nace Mikus; Laura Gschwandtner; Jay Gandhi; Guillermo Horga; Albert Powers

Real-time Active Inference for Auditory Hallucination Modeling in VR-based Voice Conversion Cumhur Erkut

Modeling uncertainty and volatility using gamified online decision-making tasks across clinical and non-clinical populations: Setup & study plan

Franziska Knolle

Activating inference: Facilitating change in psychodynamic psychotherapy

Patrice Duquette

Active Inference for Energy Smart Connected Buildings

Mohsen A. Jafari; Andrea Matta

An Active Inference Approach to Agricultural Knowledge Representation

Vasu Jindal; Huijin Ju; Zili Lyu

Bayesian Glimpse Control Boosts Active Vision RL on Atari Pong

Pengcheng Pan; Shogo Yonekura; Yasuo Kuniyoshi

**Predictive Decoding of Motor Intentions** 

Antonio R. Buonfiglio; Stefano Diomedi; Matteo Priorelli; Ivilin P. Stoianov

# **POSTER SESSION 1**

Commences after the Poster Spotlights

October 16, 2025

# **POSTER SPOTLIGHTS 3**

Active Inference for an Intelligent Agent in Autonomous Reconnaissance Missions

Johan Schubert; Farzad Kamrani; Tove Gustavi

Effects of dynamic goal prior specification on gridworld agent trajectories Thijs Jenneskens; Wouter M. Kouw

Belief Formation in LLM Agents: Information Diffusion Simulation Based on the Collective Predictive Coding Hypothesis

Yusuke Hayashi

Performing Active Inference with Explainable Tensor Networks

Philip Wilson

Free Energy Projective Simulation (FEPS): Active Inference with Interpretability

Joséphine Pazem; Marius Krumm; Alexander Q. Vining; Lukas J. Fiderer; Hans J Briegel

# **POSTER SPOTLIGHTS 4**

Dynamic Attractors as Active Inference: A Networkbased Approach to Adaptive Systems Matthew Brown; Jeong Hwan Yoon; Pedro Fontana: Harnoot Singh:

Fontana; Harneet Singh; Whitney Sales; Karl Friston

Influence of Deep Neural Network Training Methods on Continual Learning

Emma Graham; Chelsea Joe; Peter Chin; Richard Granger

Hierarchical Deep Active Inference for Efficient Long-Horizon Planning Gabriel W. Haddon-Hill; Shingo Murata

From Information Thermodynamics to Organizational Principles

Lukas J. Fiderer; Elias Kunze; Hans J Briegel

Long-term prediction of the learning process using reverse engineering of generative models

Takuya Isomura; Yuki Tanimoto; Makio Torigoe; Hitoshi Okamoto; Hideaki Shimazaki

# October 16, 2025

# **POSTER SPOTLIGHTS 5**

Material attention: A method to measure the effect of regimes of attention on decision making, using information theory and Markov chain models

Hierarchical Active Inference Modeling of Social Trust Dynamics in PTSD: Integrating Qualitative Phenomenology with Computational Psychiatry

I Feel Incapable, Therefore I Fail — an Active Inference Account of Cognitive Control Deficits in Major Depressive Disorder and Generalized Anxiety Disorder

Resilience and adaptability in self-evidencing systems

The Next Episode

Arturo José Valiño; Andy Clark; Felipe Criado-Boado; Luis M. Martínez; Axel Constant

Andrew Pashea; Jeremy Cooper; Haeun Sun; Angelos Krypotos

Mengting Zhang

Mahault Albarracin; Dalton A R Sakthivadivel

Candice Pattisapu; Maxwell J. D. Ramstead

# **POSTER SPOTLIGHTS 6**

Intracranial Neural Signatures of Decision Uncertainty Based on an Active Inference Model for Three-Armed Bandit Reversal Learning Task

An Active Inference Account of Stuttering Behavior and Clinical Implications

Exploring the computational underpinnings of the learned helplessness effect

Technological Predictions: Rethinking UX Design through Active Inference and the Free Energy Principle

**Carving Psychological Space** 

Alessandra Nicoletta Cruz Yu; Ko-Ping Chou; Ryan Smith; Ignacio Saez; Vincenzo Fiore

**Fvan Usler** 

Nace Mikus; Federico Mancinelli; Giorgia Silani; Claus Lamm; Chris Mathys

Luca Possati

Candice Pattisapu; Maxwell J. D. Ramstead

# **POSTER SESSION 2**

Commences after the Poster Spotlights

October 17, 2025

# POSTER SPOTLIGHTS 7

AXIOM: Learning to Play Games in Minutes with Expanding Object-Centric Models

Conor Heins; Toon Van de Maele; Alexander Tschantz; Hampus Linander; Dimitrije Markovic; Tommaso Salvatori; Corrado Pezzato; Ozan Catal; Ran Wei; Magnus Koudahl; Marco Perin; Karl Friston; Tim Verbelen; Christopher L Buckley

A Hardware-oriented Approach for Efficient Active Inference Computation and Deployment

Nikola Pižurica; Nikola Milović; Igor Jovančević; Conor Heins; Miguel de Prado

Bayesian Structure Learning for Scalable Active Inference

Lancelot Da Costa

Active Inference with Dynamic Planning and Information Gain in Continuous Space by Inferring Low-Dimensional Latent States

Takazumi Matsumoto; Kentaro Fujii; Shingo Murata: Jun Tani

Updating ActiveInference.jl: Modularity and Ease of Use for Active Inference Models Beyond the Discrete POMDP

Peter Thestrup Waade; John C. Boik; Jonathan Ehrenreich Laursen; Samuel William Nehrer; Dominik Firisz; Chris Mathys

Merging Biology with AI: A Brain-on-Chip for Nextgen Neuromorphic Computing Guillem Monsó; Wouter M. Kouw

October 17, 2025

# **POSTER SPOTLIGHTS 8**

Real-World Exploration and Navigation via Deep Active Inference with a Diffusion Policy and a World Model Riko Yokozawa; Kentaro Fujii; Yuta Nomura; Shingo Murata

Deep Active Inference for Real-World Robot Control Using a Temporally Hierarchical World Model Kentaro Fujii; Shingo Murata

Few-Shot Hierarchical Active Inference for Adaptive Planning with Diffusion Trajectories

Yulin Li; Mohsen a jafari; Andrea Matta

Hierarchical Active Inference for Autonomous Navigation in Microsoft AirSim with Environmentally Adaptive Planning Satyaki Maitra; Harshil Shah

Robots Inventing Tools: Task-conditioned Tool Design for Robotic Operations

Pablo Lanillos; Abián Torres; Poppy Collis; Virgilio Gomez Lambo

# **POSTER SPOTLIGHTS 9**

Attentional Narrowing and Cognitive flexibility in Active inference

Kirstin Wagner; Alexander Hemming; Dylan Grove

Resolving space-sharing conflicts in road user interactions through uncertainty reduction: An active inference-based computational model

Julian Frederik Schumann; Johan Engstrom; Jens Kober; Arkady Zgonnikov

RL Agents Exploring Communication with the Free Energy Principle

Theodore Jerome Tinker; Jun Tani; Kenji Doya

Simulating Agency Learning in Probabilistic and Social Multi-Agent Scenarios Using Active Inference

Jialin Shi; Riddhi J. Pitliya; Robin A Murphy

Making Sense of Uncertainty: Designing Experiences for Adaptive Inference

Anna Pereira

# **POSTER SESSION 3**