

AJITH K. SENTHIL

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OBJECTIVE

Seeking a Ph.D. position at the nexus of AI and human cognition. With a diverse background in interdisciplinary research settings, I am passionate about innovatively addressing complex challenges and harnessing AI to decode human cognitive processes. My commitment extends to using insights from neuroscience to enhance AI methodologies.

EDUCATION

University of Illinois Urbana-Champaign

2022 - 2024

MS Psychological Science

Graduate minor in Statistics

University of Illinois Urbana-Champaign

2019 - 2022

BS Computer Science + Linguistics

BS Brain, and Cognitive Science

Relevant Graduate and Undergraduate Coursework

Computer Science: CS 225: Data Structures, CS 374: Algorithms & Formal Computation, CS 421: Programming Languages & Compilers

AI/ML: CS 440: Artificial Intelligence, CS 441: Applied Machine Learning, CS 444: Deep Learning for Computer Vision, CS 598 Special Topics in Robot Learning (in progress)

Math/Statistics: Math 225: Linear Algebra, Math 241: Multivariable Calculus with Mathematica, Stat 400: Mathematical Statistics, Stat 410: Advanced Mathematical Statistics, Stat 431: Applied Bayesian Analysis

Linguistics: Ling 301: Syntax, Ling 307: Semantics and Pragmatics, Ling 406: Computational Linguistics, Ling 446: Speech and Signal Processing, Ling 490: Computational Semantics

Brain and Cognitive Science: Psych 302: Applied Neuroscience, Psych 331: Cognitive Psych Lab with R, BCOG 458: Advances in Brain and Cognitive Science, Psych 525: Psycholinguistics, Psych 521: Knowledge Representation

Design Thinking: Art 310: Design Thinking

TECHNICAL KNOWLEDGE

Languages (proficient)

Python, C++, Java, C#, R, C, PHP, SQL, Javascript, Haskell

Software/Frameworks

Git, Jupyter Notebook/Lab, Numpy, Pandas, NumSharp, PyTorch, Mathematica, Unity3D, NLTK, SpaCy, OpenAI API, LangChain, ChainLit, PineCone DB, HuggingFace Transformers

Interests

Meaning/Knowledge Representation, Computational Linguistics, Deep Learning, Cognitive Modelling, Behavioral modeling, Free Energy Principle-Active Inference, Information Theory, Learning, Mathematical Statistics, Statistical Learning

RESEARCH

ByCog Research Group

August 2023 – Present

University of Illinois Urbana-Champaign

Co-Founder and Researcher

- Co-founded the group to advance research on human behavior through cybernetic mechanisms, working closely with the Active Inference Institute
- Led the conceptualization and development of Computational Psychodynamics, focusing on a process-based approach to model personality and cognition through active inference
- Developed the Extended Dynamic Cognitive Vector Framework used to model situations and behavior using Active Inference as a vector framework

Active Inference Institute

July 2023 - Present

University of Illinois Urbana-Champaign

PI: Daniel Friedman, PhD

Research Intern

- Developed Computational Psychodynamics Framework, providing a deductive framework to interpret and model behavior patterns, neurological functions, and cognition using active inference
- Designed the framework to apply to diverse tech domains, such as artificial intelligence and brain computer interfaces, enabling a richer and more nuanced understanding of

human cognitive processes

- Participated in Learning Groups to delve deep into Active Inference across multiple domains
- Developed a project to use deep active inference for anomaly detection in multi-agent surveillance systems

Attachment and Close Relationships Lab

August 2022 - Present

University of Illinois Urbana-Champaign

PI: R. Chris Fraley, PhD

Researcher and Developer

- Innovated the design and implementation of Attachment Bot, a chatbot poised to revolutionize the way human attachment patterns are studied and understood
- Created a chatbot that administers attachment surveys in a conversational format
- Analyzed chat transcripts to predict attachment scores using word vector embeddings, logistic regression, and XGBoosted regression
- Hosted the chatbot on the MyPersonality.net website for the Attachment and Close Relationships Lab

Learning Language Lab

October 2020 - Present

University of Illinois Urbana-Champaign

PI: Jon Willits, PhD

Graduate Researcher and Developer

- Advancing the lab's goals in understanding the linguistic and visual aspects of cognition
- Delving into deep learning models like ResNet to shed light on visual feature representation from neural network activations

Project Dynamica

- Implemented an RNN to model behavior in C# in a multi-agent simulation in a Unity 3D virtual simulation with C#

- Conceptualized and implemented Neural Networks to model Human Behavior

OpenPolitica

June 2023 - Present

AI/ML Team Leader

- Orchestrated the development and roll-out of PolicyWeb to foster democratic participation and civic discourse
- Fostered collaboration and partnership with the Forward Party, aiming to minimize political partisanship and promote democratic values

NeuroTech@UIUC

February 2022 - Present

University of Illinois Urbana-Champaign

Universum Project Manager & Machine Learning Developer

- Organized a team of developers and mentored undergraduates in a student organization to work with autoencoders, transformer models, and EEG headsets for the Universum project advised by Dr. Catherine Best-Popescu and Dr. Dan Llano in the Beckman Institute (Universum)
- Applied computer vision models for pose estimation using CNNs (Universum)
- Predicted and modelled proprioception using EEG data using autoencoders and transformer models (Universum)
- Developed Neural Networks with PyTorch to predict Parkinson's disease in open-source data
- Contributed to the Neural Technology Student-Run Organization Research and Application Division

Business Strategy and Analogical Reasoning Research

May 2021 – August 2022

Gies School of Business, University of Illinois Urbana-Champaign

PI: June-Young Kim, PhD

Research Assistant

Natural language processing project

- Developed NLP models to analyze analogical reasoning and organizational behavior

- Created unique computational linguistic measures for research in human behavior in business settings
- Analyzed sentiment, metaphors, analogies, and conversation using NLP models

Siegel Lab

May 2017 - October 2017

University of California Davis Genome Center
PI: Justin Siegel, PhD

Research Assistant

Computational Genomics Project

- Modelled Novel Enzymes Catalysts computationally using FoldIt and Python
- Gained Wet Lab and Dry Lab Experience modeling enzymes and Kunkel mutagenesis on E. Coli
- Engaged in the Design-Build-Test cycle
- Created an initial prototype of the application used as a database for the lab to streamline data collection

INDEPENDENT PROJECTS

Multi-Agent Surveillance Using Active Inference and Reinforcement Learning

This project aims to integrate active inference principles for predictive anomaly detection, while leveraging reinforcement learning (RL) techniques, such as the Soft Actor-Critic (SAC) decomposed for multi agent settings, for dynamic task allocation and coordination among the robots.

Narrative Generation with Simulated Personality

Used Markov chains to model personality and cognition based on active inference in characters in narratives by modeling transitions between latent behavior states to model event-driven narrative generation with LLMs. Used Image Generation models to add event-driven scene generation.

Narrative Analysis with Psychometric Enriched Event Representations

Used prototype classes to model personality and cognition based on active inference in characters in narrative event representations and performed analysis on a multi-head

attention transformer model (CircEvent) to see how adding the psychometric changed the performance on the MCNC task

PolicyWeb

Organized a team for full stack developers, AI developers, and data scientists and developed LLM based contextual analysis to analyze concerns related to public policy making in chat transcripts with a government representative chatbot. Implemented a Q-methodology-based live survey ranking feature to make a data-driven approach to modeling subjective views on specific policy and user concerns around public policy. Data driven approach to policy creation as the platform for the Forward Party.

Mentorship Website

Developing and creating a website for the mentorship program, allows for scheduling and coordination of mentors and mentees in the psychology department at the University of Illinois at Urbana-Champaign

MANUSCRIPTS IN PREPARATION

Senthil, A (*In preparation*) Computational Psychodynamics: Process-Based Approach to modeling Cognition and Personality Using Active Inference

Senthil, A , Joshi, O. Ashtikar, S. (*In preparation*) Computational Psychodynamics: Validation of Psychometrics in Narrative Generation and Simulation

Senthil, A., Saxma, M., Palmiero, M. C., & Fraley, R. C. (*In preparation*) AttachmentBot: Tutorial for psychology researchers to use chatbots and embedding analysis in their research

PRESENTATIONS

Senthil, A. (2023, April 20) *Computational psychodynamics: Process-based approach to modeling personality* [Poster presentation]. Master of Science in Psychological Science Research Fair, Department of Psychology, University of Illinois, Champaign-Urbana, IL.

Interview with Binyamin Tsadik: *Ajith Senthil Personality, AI and Narratives*

VOLUNTEER WORK

Xoom Learning (*May 2015 – Jan 2019*): Tutored and developed after school course materials for 55 children from India and Sacramento in underprivileged communities in Math, English and Computer Science