Amazon-Illinois Center on AI for Interactive Conversational Experiences (AICE)
Call for Proposals 2024-2025

Abstracts Due: March 29, 2024
Full Proposals Due: May 24, 2024

1. INTRODUCTION

Recent advances in Natural Language Processing (NLP) and Large Foundational Models allow us to develop complex conversational Artificial Intelligence (AI) techniques for various scenarios, such as task-oriented and chit-chat dialog systems, and even to guide users in performing complex real-world tasks. However, existing systems still lack deep knowledge acquisition and reasoning. They are also generally limited to interactions in single data modalities (e.g., text or speech). Further, they are incapable of continued self-learning, self-updating and self-correction. The Amazon-Illinois Center on AI for Interactive Conversational Experiences (AICE) is a collaboration between Amazon and University of Illinois Urbana-Champaign, to revolutionize the paradigm and develop intelligent conversational systems that can automatically acquire, create, validate, reason, and update their knowledge through multimodal interactions with data and human users.

2. CONTEXT

Amazon is improving customers' lives with practical, useful generative AI innovations. We do this by building and deploying AI across three technology layers: at the bottom layer we offer our own high performance and cost-effective custom chips, as well as a variety of other computing options including from third-parties. At the middle layer, we offer customers choice by providing the broadest selection of Foundation Models—both Amazon-built as well as those from other leading providers. At the top layer we offer generative AI applications and services to improve every customer experience.

There are three things that distinguish Amazon's approach to the development and deployment of AI:

1) Maintaining a strategic focus on improving the customer and employee experience through practical, real-world applications of AI;
2) marshaling our world-class data, compute, and talent resources to drive AI innovation; and
3) committing to the development of responsible, reliable, and trustworthy AI.

3. CFP 2024-2025 TOPICS

The AICE Center is calling for proposals for the second funding round, 2024-2025 academic year. In this phase, the center will support 3-5 sponsored projects. Each funded project will support a PhD research assistant and 2-4 weeks of summer salary for principal investigators (PIs). Each selected project will then engage with research scientists from Amazon to collaborate and jointly advise PhD students.

Topics of interest would include, but are not limited to, those below. Please feel free to bring your unique viewpoint and expertise to these topics:

Large Language Models (LLMs):

- Retrieval augmented generation (RAG), fine-tuning and alignment (SFT, RLHF, DPO), and efficient inference: ensuring accuracy and reducing hallucinations; maintaining privacy and trust; reasoning over long contexts
- Context-dependent alignment under disparate cultural and moral systems
- Long form context methods
- Improving data efficiency; effectively distilling models for real-time inference, data quality checks
- Multi-lingual LLMs and challenges for cross-language defects (e.g. cross-language hallucinations)
- Synthetic data generation for LLM learning
- Adapting LLMs for dynamic content (e.g., feeds, web content) in knowledge-augmented scenarios
- Tool and Code Empowered LLM
- External Knowledge and Domain Knowledge Enhanced LLM and Knowledge Updating

Vision-Language:

- Multimodal learning and video understanding: retrieval with multimodal inputs (e.g., video, image, text, speech)
- Adversarial ML with multimodal inputs
- Comprehensive video understanding with diverse content (open-vocabulary).
- Shared multimodal representation spaces, aligned codecs
- LLM and VLM based Intelligent Agents
- Systems theory for constructing intelligent agents from several existing pretrained AI models

Search and Retrieval:

- Personalization in Search, semantic retrieval, conversational search: understanding descriptive and natural language queries for product search; retrieving information using LLMs' output
- Search page optimization (ranking) using heterogeneous content such as related keywords, shoppable images, videos, and ads
- Tool Learning for Proactive Information Seeking

Efficient Generative AI:

- Novel model architectures for improved performance (accuracy & efficiency), including equivariance-based ones
- Training large neural network models with efficiency: High performance distributed training and inference algorithms for Generative AI systems, quality metrics and evaluations

Responsible Generative AI:

- This may include, but is not limited to measurement and mitigation, guardrail models, privacy concerns, detecting and mitigating adversarial use cases, and machine unlearning and model disgorgement
- Responsible AI for audio, image and video generation
- Privacy preserving continual learning/self-learning
- Fact Checking and Factual Error Correction for Truthful LLMs
- Safety and governing of agentic AI systems that may act in the physical world

4. PROPOSAL GUIDELINES

- Eligibility: Full-time tenure-track, research-track and teaching faculty members at Illinois are eligible to submit proposals as PIs.
  Note: Faculty members that will be Amazon Scholars in AY 2024-2025 are eligible to submit proposals but must adhere to university conflict of interest policies and procedures. These individuals are encouraged to consult the legal teams at their home departments well in advance of proposal submission.
- Submissions should not reference either Amazon or Alexa, nor speculate about how the research might be applied to current or future Amazon products, services, business models or needs. Proposals should focus on the science.
- Stage 1 abstract submissions are due **March 29, 2024**. Interested UIUC faculty submit a **1-page maximum overview** (excluding references) of a potential full proposal. The purpose of these abstracts is for Amazon to review and provide feedback on the proposal: would Amazon be interested in collaborating with this researcher, could the proposal include new use cases for the science, and does the project align with industry goals. Feedback will help guide the faculty member towards submitting a more relevant and impactful proposal. Abstracts are not a prerequisite for submitting proposals. A PDF of the 1-page abstract should be submitted to aice-management@lists.cs.illinois.edu **on or before March 29, 2024, at midnight CDT.**
- An AICE abstract feedback session will be held between **March 29-April 13, 2024**. The Amazon Science review team will give feedback on whether a full proposal is encouraged for each abstract submission. It is hoped that this exchange will serve as a matchmaking exercise, enabling the development of well-focused proposals that are aligned with the interests of the PI and Amazon.
- Stage 2 full proposal submissions are due **May 24, 2024**. PIs who did not submit abstracts are still eligible to submit full proposals. The proposal should not exceed three pages, with unlimited references. PIs are encouraged to seek collaborations with research scientists at Amazon to prepare for proposals. Proposals will be evaluated by a collaborative advisory board composed of AICE Leadership Team (excluding board members who submitted proposals) and Amazon scientists for their technical merits and innovations, topic relevance, potential to advance research in focus areas, and broader impact.
  - Full Proposal Format: The proposal format is single-spaced, 11-point font or larger, with no less than 0.5-inch page margins. The proposal should include the following content:
    - Full names and email addresses of all PIs involved

        - Project description (3 pages max), including the focus area of proposal (per Call for Proposal process) title, PI(s), an executive summary, technical description of the project, expected deliverables/outcomes, milestones and what plans exist for open sourcing data or results
        - List all university background IP (unlimited)
        - References (unlimited)
        - Requested budget (1 page max), use format shown in Section 8
        - Biographies of the PIs (up to 3 pages per PI in NSF Format)
    - Selection criteria: Successful projects will be evaluated on the promise and progress in the quality of publications, student mentoring, and potential technology transfer activities.
    - Project period of performance: September 1, 2024–August 31, 2025.

5. Important Dates

- March 5, 2024: Center Symposium in Chicago/CFP Topics Announced
- March 29, 2024: Abstract Submission Deadline
- March 29 - April 13, 2024: Abstract feedback sessions with Amazon scientists and UIUC Faculty
- May 24, 2024: Full Proposal Submission Due
- Early July 2024: Full Proposal Acceptance Notification
- TBD September 2024 (On Campus AICE Center Event)

6. Submission and Contact Information

PDFs of the submissions documents should be uploaded to the University of Illinois Urbana-Champaign Office of the Vice Chancellor for Research & Innovation (OVCRI) Special Programs portal, located (https://specialprograms.research.illinois.edu/) HERE. For questions about the proposal submission process, please contact [aice-management@lists.cs.illinois.edu]. For questions about the AICE Center, please contact the center director Prof. Heng Ji [hengji@illinois.edu] or the leadership team: [aice-leadership@lists.cs.illinois.edu].

7. AICE Leadership Team

- Director: Heng Ji (Illinois)
- Center Liaison: Ruhi Sarikaya (Amazon)
- Principal Program Manager: Rajiv Dhawan (Amazon)
- Project Manager: Vincent Ponzo (Amazon)
- Center Alliance Manager: Andrea Whitesell (Illinois)
- Advisory board members: Julia Hockenmaier (Illinois), Derek Hoiem (Illinois), Angeliki Metallinou (Amazon), Pradeep Natarajan (Amazon), Kevin Small (Amazon), Lav Varshney (Illinois)

8. Budget Format

Work with your department business office to complete a budget table in the format shown below. The categories and text in the "basis of estimate" column are provided as examples; please update to reflect actual expenses and project needs.

Per the Collaboration Agreement, no F&A costs are to be assessed on Gift-Funded Research Projects. If, through the review process, the project is deemed to be a Sponsored Research Project, budgets will be renegotiated.

Item	**Amount**	**Basis of Estimate**
PI Summer Salary	$XX	2 weeks summer salary, including fringe benefits
GRA Salary Support	$XX	X-months GRA at Y% effort, including fringe
Other Direct Costs	$XX	List items. E.g., hard drives, high-speed cluster access, publication fees, software costs, travel
Total	$XX	