Guest Researcher Position Description

Research Title: Computational Neuroscientist NIST GenAI program

This position provides software and web development support for activities in the Technology Test and Evaluation Division (TTED) at the National Institute of Standards and Technology (NIST). The work will advance the NIST GenAI evaluation series (https://ai-challenges.nist.gov/genai).

The candidate will assist in the development of a cutting-edge human assessment infrastructure and a social cognition assessment that supports NIST GenAI evaluations in various modalities (such as text, voice, image, and video). The infrastructure includes a web platform, evaluation pipeline (backend/frontend), database schema, and other related tasks. The development includes creating a dataset using frontier AI/LLM tools, conducting experiments, performing statistical data analysis, and writing technical reports. The candidate will actively participate in the NIST measurement science and be involved in cutting-edge research and evaluation in the field of Generative AI technologies. U.S. citizenship is preferred.

Key responsibilities will include but are not limited to:

- Building cutting-edge AI evaluation infrastructure for human assessment
- Designing human participant studies for social cognition assessment, leveraging frameworks for experimental design, individual differences, and repeated-measures analysis
- Developing and deploying a full-stack application that integrates computational content analysis with human cognitive response measurement
- Engineering prompt pipelines to generate controlled AI-generated content across models and other experimental conditions
- Extracting and interpreting linguistic, syntactic, semantic and structural features of AI-generated content, and evaluating their relationship to human perception and behavioral responses using computational analysis
- Applying signal analysis methods (information theory, topological data analysis, spectral methods) on high-dimensional representation spaces
- Developing and deploying a framework for installing and executing AI systems with a large dataset on a GPU-accelerated cluster
- Conducting experimental design and dataset curation
- Developing/Deploying baseline algorithms in generative AI
- Upgrading, maintaining, and continuously developing existing NIST GenAI software
- Managing data, such as querying and translating data formats/specifications

Qualifications

This individual must have the following **minimum** knowledge, skills, and abilities:

- Experience in statistical and machine learning methods: experimental design, linear mixed models, causal inference, effect size interpretation and interpretable AI (feature attribution)

- Experience with signal analysis methods, including information theory, spectral analysis, and array signal processing
- Experience with high-dimensional embedding spaces, dimensionality reduction (PCA, UMAP, tSNE) and geometric data analysis (TDA, information geometry)
- Experience with mathematical/computational modeling of cognitive or behavioral processes (signal detection theory, item response theory, belief updating)
- Background in neuroscience, cognitive science, or a field involving human participant study design and analysis
- Proficiency in a programming language such as Python, Java, Java Script, Matlab, OpenGL, C and C++
- Proficiency in shell scripts (Bash, etc.)
- Data-flow Middle-ware extensions (Synchronization and Metadata), C++, Real Time.
- Real-time code development using a distributed computing environment
- Computer Vision and Array Signal Processing (adaptive and non-adaptive filtering)
- Mastery of the principles, practices, methods in a specialty of a technical professional field (in science, computer science, software engineering, information technology, or mathematics, or related field).

Furthermore, the following knowledge skills, and abilities are **preferred**:

- Research experience related to various generative AI tools, including Large Language Models
- Experience in a full-stack web developer with tools potentially including using Ruby on Rails: Rails5, Postgres, HTML/CSS, Javascript
- Experience in database management (e.g., PostgreSQL, MongoDB)
- Experience with jupyter notebooks, R, Shiny and interactive plots
- Experience in cross-platform software development (Linux, Mac OS X, Windows)
- Experience/interest in machine learning and AI test and evaluation

How to apply:

Employment Terms: This opportunity is to be an associate researcher in the NIST AI Technologies group for a term of one year. Associate researchers are NOT Federal Employees, but they work aside NIST researchers. Relocation expenses will not be provided.

This is a full-time position that provides total compensation of $62,000.

How to express interest: U.S. Citizens who meet all the required qualifications and who would be interested in taking this position are invited to express their interest in the position by sending an updated CV/resume to Yooyoung Lee at Yooyoung.lee@nist.gov.