AI @ UNM
Monday, November 11, 2024

09:30 - 10:00 Welcome and Opening Remarks
Donna Riley, School of Engineering Dean
Ellen Fisher, Vice President for Research
Melanie Moses, Professor of Computer Science

10:00 - 10:30 Susan R. Atlas, Associate Professor, Chemistry & Chemical Biology, Physics & Astronomy, and Center for Quantum Information & Control
Title: The 2024 Nobel Prizes in Physics and Chemistry, and the Machine Learning/AI Revolution in Quantum Molecular and Materials Modeling
Abstract: In a single remarkable week, two separate Nobel Committees recognized the profound impact that machine learning (ML) and AI are having on understanding and controlling quantum-driven interatomic interactions in systems ranging from diatomic molecules to proteins and materials, Five scientists were cited for the development of foundational techniques that enable machine learning with neural networks (Hopfield and Hinton), applications to computational protein design (Baker), and protein structure prediction (Hassabis and Jumper). Following a brief overview of the Nobel awards and their conceptual ties to transformer-based AI, I will describe how ML/AI methods can be used to (1) flexibly represent complex and dynamically-evolving quantum mechanical interactions among atoms, including chemical bond formation and breaking; and (2) develop principled methods for predicting and optimizing mechanical properties of compositionally-complex high-entropy alloys.

10:35 - 10:50 Abdullah Mueen, Professor of Computer Science
Title: Intelligent Behavioral Analysis can Reduce Anonymity on Blockchain
Abstract: In this short talk, I will present a case where we exploit the temporal behavior of blockchain accounts to link them into a larger group of accounts to infer more information about them. In the end, I will summarize a few privacy threats that future AI might pose.

10:55 - 11:10 Jonathon E. Slightam, Sandia National Laboratories
Title: Data-Driven and AI approaches for Robotic Manipulation

11:15 - 12:00 Panel "Future of AI for Education, Research and Everything"
Melanie Moses (Prof. of Computer Science, moderator),
Doug Perkins, Director of the Center for Global Health (HSC),
Trilce Estrada (Associate Prof. of Computer Science),
Victor Law (Associate Professor and Program Director of the Program of Organization, Information, and Learning)
Stewart Copeland, Director UNM ARTSLab, Asst. Professor Experimental Art & Technology

12:00 - 1:00 Lunch with discussion and collaboration opportunities

1:00 - 1:30 Enrico Pontelli Prof. of Computer Science, Dean of A&S, NMSU;
Cleve Moler & MathWorks Chair in Mathematical & Engineering Software Distinguished Lecture
Title: A Quick Overview of AI Research Capacity at New Mexico State University
Abstract: In this short presentation, I will present a very broad strokes overview of current research interests and capacity in the area of Artificial Intelligence at New Mexico State University, along with some recent educational initiatives launched by the institution.

1:35 - 2:05 **Matthew Fricke:** Associate Research Professor of Computer Science, CARC
Title: Supporting Practical Artificial Intelligence Pipelines at the Center for Advanced Research Computing

2:10 - 2:25 **Sonia Gipson Rankin**, Professor of Law
Title: Deepfake Technology: Balancing Innovation and Ethics
Abstract: This talk explores the technical creation of deepfakes, their potential for misuse, and the evolving legal landscape surrounding their regulation. We will examine the challenges deepfakes pose to privacy, defamation, and intellectual property laws, emphasizing the need for robust legal responses. This session underscores the urgency of adapting our legal frameworks to address these emerging digital threats.

2:25 - 2:40 Break

2:40 - 2:55 **Sarah Dreier**, Assistant Professor of Political Science
Title: AI and Text: Sources of bias and classification outcomes.
Abstract: Large language models (LLMs) serve as the architectural backbone for popular, public-facing AI tools like ChatGPT and Google Gemini. This talk begins by

introducing the concept of contextual word representations (CWRs), which are a critical component of these models. I explain how CWRs are necessarily shaped by the geo-temporal context and social norms in which they are trained, which can yield underperformance and/or biased in LLM performance. Next, I present research that examines CWRs at opposite ends of the natural language processing pipeline. First, I present research that evaluates how well LLMs perform at capturing and classifying text generated in the past (1970s) and in an idiosyncratic context (by British government bureaucrats). This research proposes a path forward that uses LLMs alongside (but not in place of) manual classification to reduce human annotation time. Second, I present research that demonstrates social biases in what language is selected to train CWRs in the first place. This research demonstrates that an author's social, economic, geographic, professional, and personal identity shapes whether that language is classified as "high quality" and therefore selected to train CWRs. My co-authors and I conclude by suggesting that privileging any corpus as high quality entails a language ideology, and we suggest that more care is needed to construct training corpora for language models, with better transparency and justification for the inclusion or exclusion of various texts.

Co-authors: Sofia Serrano, Emily Gade, Suchin Gururangan, Dallas Card, Leroy Wang, Zeyu Wang, Luke Zettlemoyer, Noah Smith

3:00 - 3:15 **Avinash Sahu** Assistant Professor in the Division of Translational Informatics, Department of Internal Medicine, UNM HSC

Title: Leveraging Relational Data: Enhancing Biomedical Predictions with GNN-LLM Integration

Abstract: In this presentation, I will discuss how integrating Graph Neural Networks (GNNs) with Large Language Models (LLMs) enhances biomedical predictions. This approach improves the analysis of gene-drug interactions, identifies tumor vulnerabilities, and mitigates biases through message-passing algorithms within complex biomedical networks.

3:20 - 3:35 **Manel Martinez-Ramon and Ramiro Jordan** (Professors of Electrical and Computer Engineering & Peace Engineering)

Title: The Peace Engineering Consortium

Abstract: In November 2018, the University of New Mexico, School of Engineering (UNM-SOE), hosted the First Global Peace Engineering Conference in the annual event

of the World Engineering Education Forum and the Global Engineering Deans Council (WEEF-GEDC 2018). The objective was to present Peace Engineering as an emerging area of study. The goals of the first global conference on Peace Engineering include creating new academic programs and opening new areas for education, research, innovation, and entrepreneurship. Peace Engineering's mission is to actively cultivate a culture of peace, and this mission requires that peace engineers, global citizens, and professionals of all disciplines be well-rounded global thinkers and doers, cognizant of (i) their professional and personal ethical responsibilities; (ii) their roles in society as citizen engineers and/or scientists, practitioners or policymakers; and (iii) intended and unintended consequences of their decisions relating to design, planning, management, and operation of projects in different socioeconomic, cultural and political situations. Peace engineering is defined not only by its sociotechnical applications but by its ethos and aims with an agenda formulated in service to social justice.

3:40 - 4:00 1-minute lightning talks to preview posters

4:00 - 5:30 Poster session with appetizers