Artificial Intelligence Research for Health

- Enable breakthroughs in health with advances in AI
- Nurturing collaborations between researchers in AI and those in the health sciences.
- AI now scales to real problems in business, science and **health**
- Health data has become plentiful
  - Electronic Health Records
  - Genomic Data
  - Sensors and Wearables
  - Medical Images
  - Social Media Postings
  - Journal Publications
  - Medical Ontologies
  - Microbiome …
Information Science Institute AI Strengths

• Image and Video Analysis
• Computational Social Science & Social Networks
• Text, Speech, Language Translation
• Sensors and Wearables, Mobility Data
• Data Management: Collection, Analysis, Curation
• Machine Learning: Tabular, Text, Image, Time Series, Video, Multimodal
• Knowledge Graphs
• Other computing topics: Networks, Security, Privacy, Quantum, Chips
Classifying Images

Detecting Glaucoma from Fundus Photographs Using Deep Learning without Convolutions: Transformer for Improved Generalization
Wael AbdAlmageed: AI Predicts Congenital Adrenal Hyperplasia

- Improving quality of care/life of CAH patients via personalized medicine is expensive (e.g., frequent genotype testing and hospital visits)
- Phenotypic biomarkers for CAH did not exist
- Hypothesis: Facial morphology is correlated to CAH and can be used as a phenotypic

Explaining Image Classification

• Several approaches to finding parts of image important to classification
  – Examine hidden units of network
  – Manipulate image and see impact on classification
  – Highlight regions in order of importance red, yellow... blue (heatmap, saliency, attention

• Has proven useful to developers in understanding and debugging

Glaucoma

Melanoma
Would you trust a robot to identify and remove cancerous moles?
Explainable AI systems should explain like experts

Dermoscopic image of the SSM shown in Figure 1A, showing multiple colours, milky pink structureless areas centrally (*), white streaks (^) and atypical pigment network (arrows);

small right pleural effusion (black arrowhead) and septal thickening (white arrowhead and subpleural portions of lung (black arrows).”

parapapillary atrophy (arrowheads) and rim notching (arrows).”
Explaining Like Experts

• Quote from a reviewer: However, the second aim of testing the explainability aspect has been tested only as averages in global sense, without testing if the attention location makes sense with clear clinical correspondences.

• Multi-task learning: Diagnostic features and class labels

• Use explainable AI on diagnostic features. Use arrows instead of heatmaps
Working with ISI

• Collaborations on NIH proposals
• ARPA-H
• NIH FAIR
• Getting Started
  – Bootstrapping with existing funding and students
  – Seed Grants?
• Visitor Offices in Marina Del Rey