# ARTIFICIAL INTELLIGENCE RESEARCH FOR HEALTH

Michael Pazzani

Pazzani@isi.edu

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 …

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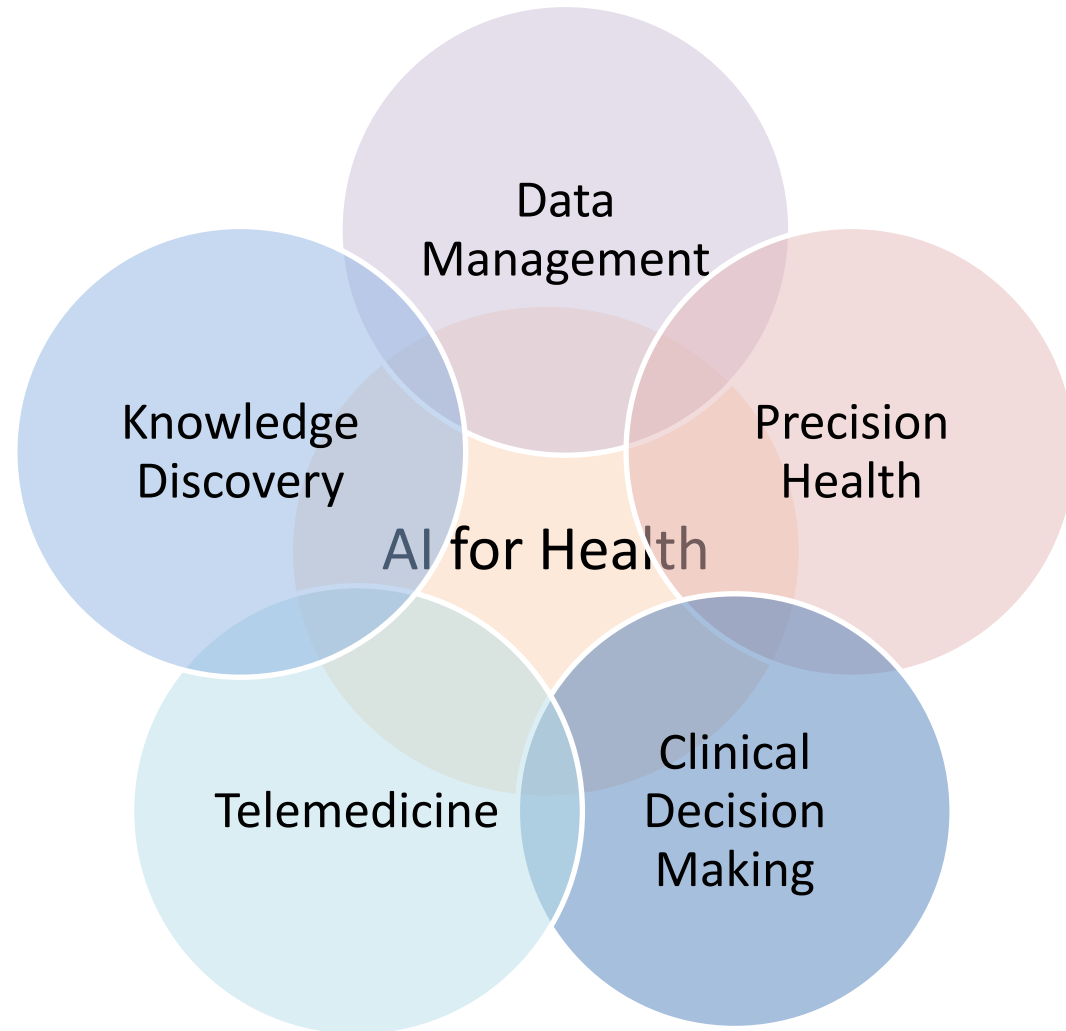
Information Science Institute AI Strengths

- 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

People

Michael Pazzani
DIRECTOR

Wael AbdAlmageed
CO-DIRECTOR

Jose-Luis Ambite
CO-DIRECTOR

Abigail Horn
CO-DIRECTOR

Greg Ver Steeg
CO-DIRECTOR

Yixue Zhao

Yigal Arens

Keith Burghardt

Emilio Ferrara

Yolanda Gil

Mayank Kejriwal

Carl Kesselman

Kristina Lerman

Luis Garcia

Jelena Mirkovic

Shri Narayanan

Mohammad Rostami

Ralph Weischedel

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Classifying Images

Normal

Glaucoma

Glaucoma

Normal

Convolution — Convolutional Layer

Pooling — Pooling Layer

Flattening
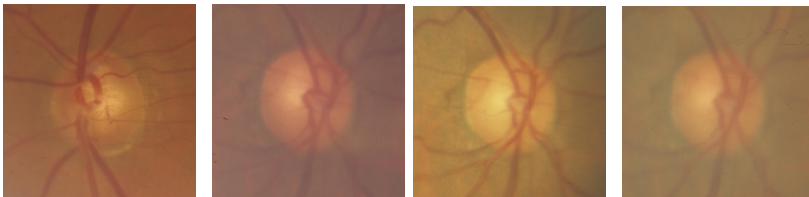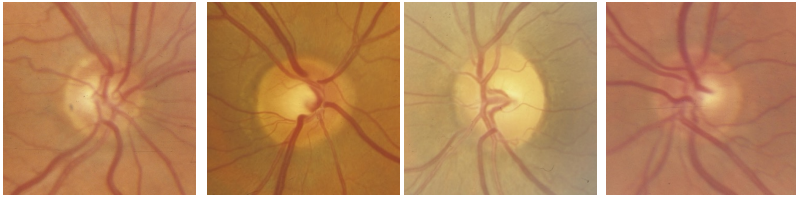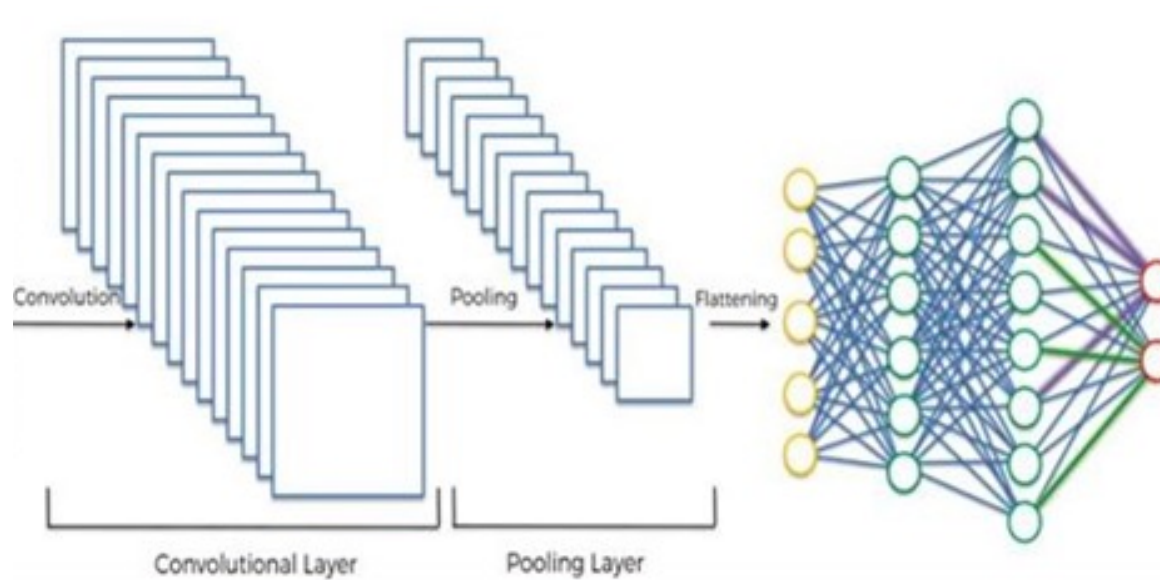
[Detecting Glaucoma from Fundus Photographs Using Deep Learning without Convolutions: Transformer for Improved Generalization](#)
Fan, R., Alipour, K., Bowd, C ., Christopher, M., and Brye, N., and Proudfoot, J., Goldbaum, M., Belghith, A ., Girkin, C., and Fazio, M., Liebmann, J., Weinreb, R., Pazzani, M., Kriegman, D., &Zangwill, L. *Ophthalmology Science*, 2022

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# 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 didnot exist
- Hypothesis: *Facial morphology is correlated to CAH and can used as a phenotypic*
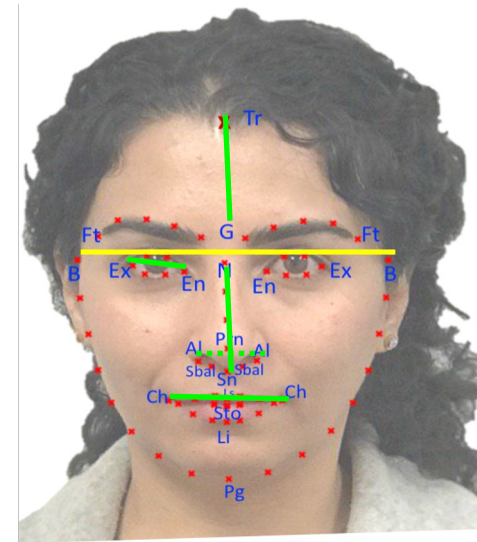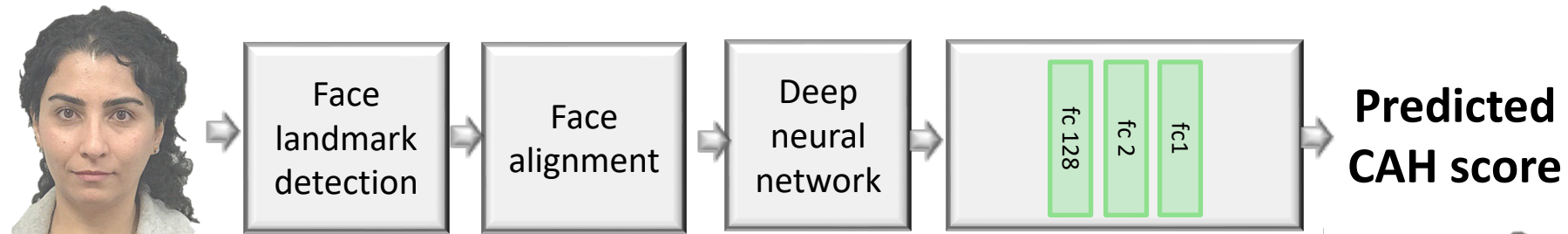
W. AbdAlmageed, H. Mirzaalian, X. Guo, L. M. Randolph, V. K. Tanawattanacharoen, M. E. Geffner, H. M. Ross, M. S. Kim , *Assessment of Facial Morphologic Features in Patients With Congenital Adrenal Hyperplasia Using Deep Learning*, JAMA Network Open, Vol. 3, Nov. 2020.

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

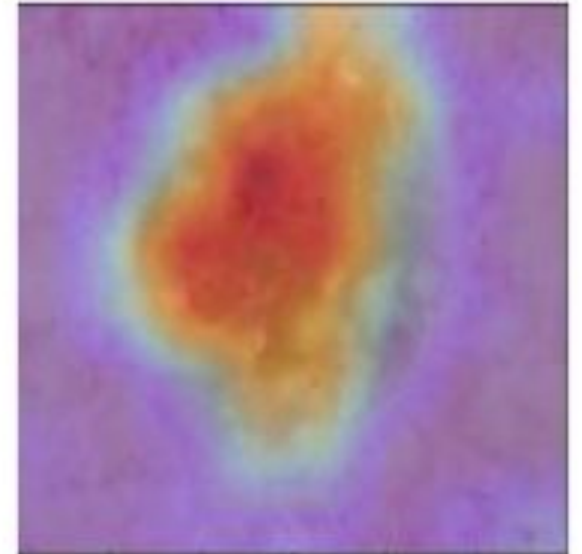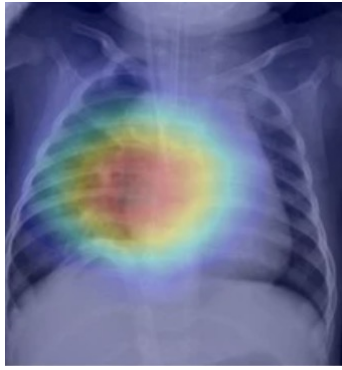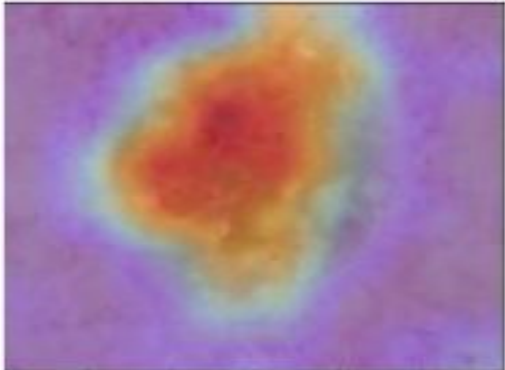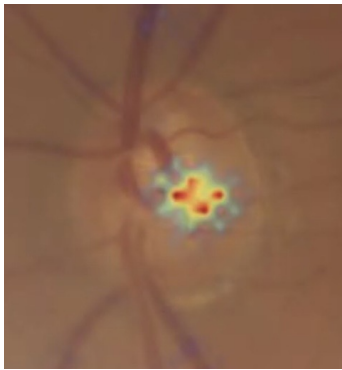- Has proven useful to developers in understanding and debugging
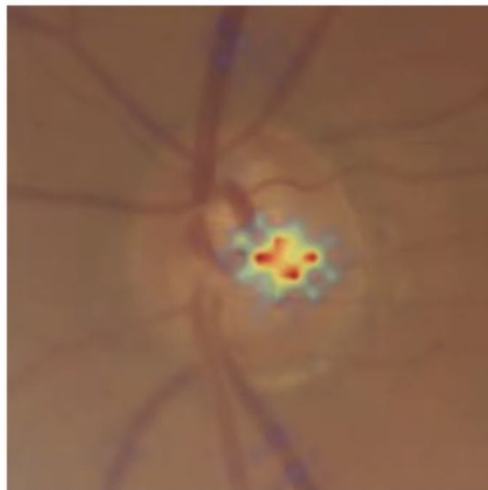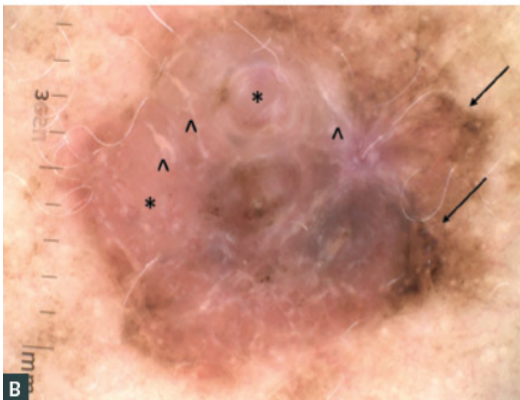

Glaucoma
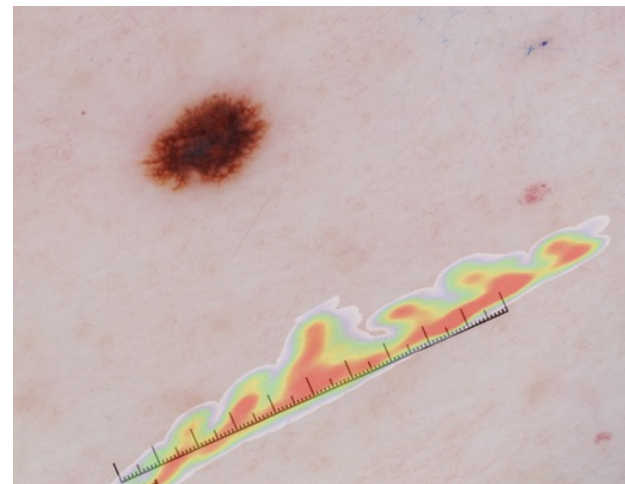
Melanoma

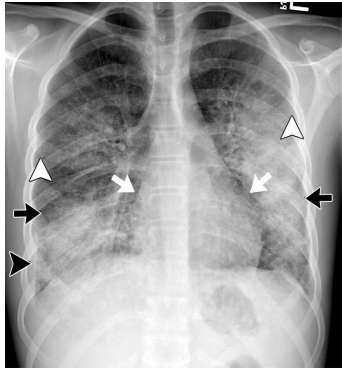# Would you trust a robot to identify and remove cancerous moles?

Explainable AI systems should explain like experts

parapapillary atrophy (arrowheads) and **rim notching** (arrows)."

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)."

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

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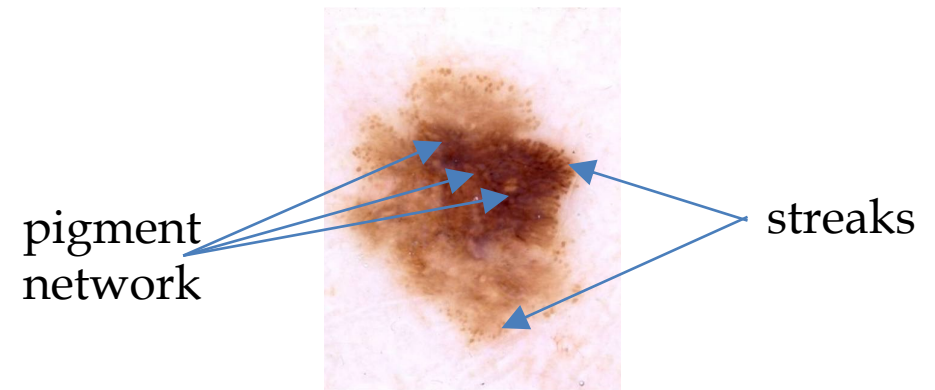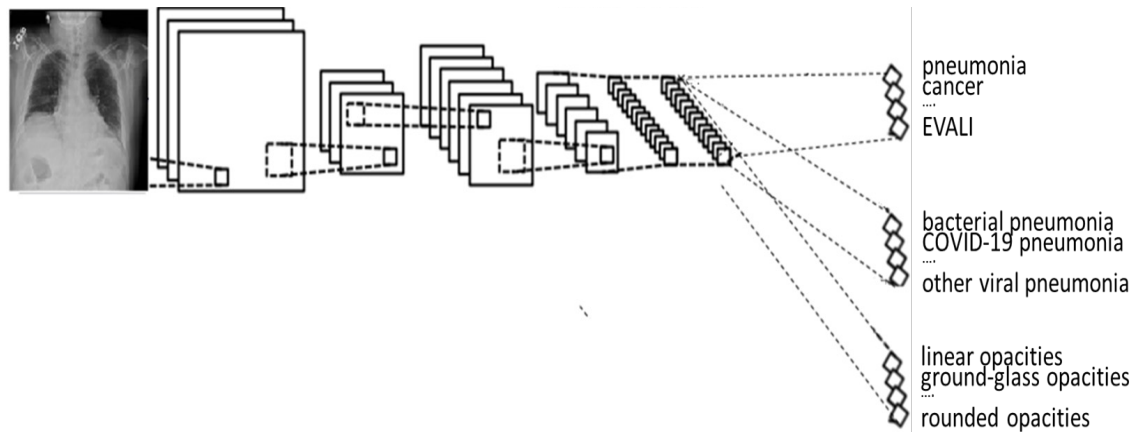
Working with ISI

- Collaborations on NIH proposals

- ARPA-H

- NIH FAIR

- Getting Started
  - Bootstrapping with existing funding and students
  - Seed Grants?

- Visitor Offices in Marina Del Rey

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