Symposium Agenda for
"Bridging the Divide: Machine Learning in Medicine"

DAY 1

6:00 am Bus departure from NYC (1300 York Ave.)
10:30 am NYC attendees arrive at Courtyard by Marriott, check-in/drop off luggage
11:25 am Bus departure from Courtyard by Marriott to Lab of Ornithology

11:30 am **Lunch and Registration**

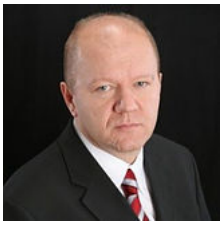
11:45 am Bus from Gates Hall to Lab of Ornithology

12:30 pm **Welcome and Introductions**
Amy Kuceyeski, Mert Sabuncu, James K. Min and Martin T. Wells

12:35 pm **Session 1 (all talks ~10 mins with 5 mins for Q&A)** – Open to all campuses and broadcast via Zoom
Mert Sabuncu (CU) – *Machine learning in neuroimaging*
Sumit Niogi (WCM) - *Standardizing and Simplifying the Reporting and Management of Acute TBI Using Artificial Intelligence and Machine Learning*
Susan Gauthier (WCM) – *Application of multi-modality neuroimaging to explore mediators of CNS injury and biomarkers for disease progression in multiple sclerosis*
David Matteson (CU) - *Non-Gaussian Component Analysis for Neuroscience*
Amy Kuceyeski (WCM) – *Quantitative connectomics: understanding, diagnosing and treating neurological disease*
Jason Mezey (CU/WCM) – *TBD*
Karla Ballman (WCM) – *Breast Cancer Genomic Signature*
Daniel Gardner (WCM, remote) – *The link between ANN and the brain's neural architecture*

2:35pm Coffee break
2:30pm Bus from Gates Hall to Lab of Ornithology

3:00 pm **Keynote Address -** Open to the entire campus and broadcast via live stream



Artificial Intelligence: Implications for Advanced Imaging and Precision Medicine
Dorin Comaniciu, PhD
Vice President, Medical Imaging Technologies
Siemens Medical Solutions, Inc

4:00pm **Session 2 (all talks ~10 mins with 3 mins for Q&A)** – Open to all campuses and broadcast via Zoom
Yiye Zhang (WCM, remote) - *Developing and Maintaining Clinical Decision Support Using Clinical Knowledge and Machine Learning: The Case of Order Sets*
Yize Zhao (WCM, remote) - *Genome-wide Heritability Analysis with Whole Brain Neuroimaging Phenotypes*
Fabien Campagne (WCM, remote) - *Learning tensor encodings of structured data instances, application to genotype calling*
Haiyuan Yu (CU) – *Precision medicine through 3D interactome models and network perturbation studies*
Marty Wells (CU) - *A Scalable Empirical Bayes Approach to Variable Selection in*

Generalized Linear Models
Philipp Messer (CU) - *Large-scale simulations for population genetic inferences*
Yang Ning (CU) - *High-dimensional propensity score estimation via covariate balancing*
Andrew Gordon Wilson (CU) - *Deep Learning with Uncertainty*
Vanessa Aguiar-Pulido (WCM) - *Single cell RNA-seq as a tool to study neurodevelopment*

6:00pm Poster Session and Reception
Judges: Florentina Buena, Olivier Elemento, Jason Mezey and Karla Ballman

7:15pm Dinner
8:30 pm Bus from Lab of Ornithology to Gates Hall
9:00pm Bus from Lab of Ornithology to Courtyard by Marriott

DAY 2
7:25 am Bus departure from Courtyard by Marriott to Lab of Ornithology
7:45 am Bus departure from Gates Hall to Lab of Ornithology

7:30am **Breakfast**

8:30am **Session 3 (all talks ~10 mins with 3 mins for Q&A)** – Open to all campuses and broadcast via Zoom
Henning Voss (WCM, remote) – *Hypersampling of MRI signals and cerebral pulse wave imaging*
Keith Hentel (WCM, remote) - *TBD*
George Shih (WCM, remote) – *Crowdsourcing Annotations for Radiology AI*
Giles Hooker (CU) - *Prediction Uncertainty and Causality using Random Forest Models*
Kilian Weinberger (CU) - *Deep Learning with Dense Connectivity*
Jim Min (WCM) – *Machine learning in cardiac imaging*
Curtis Cole (WCM) – *Helping Students Learn Machine Learning*
Thomas Campion (WCM) - *Supporting Researchers with Electronic Patient Data*
Chris Mason (WCM) - *Machine-learning approaches for genetic, epigenetic, and forensic science*
Olivier Elemento (WCM) – *AI-driven drug discovery*
Iman Hajirasouliha (WCM) – *Robust Automated Assessment of Human Blastocyst Quality using Deep Learning*

11:00am Coffee Break

11:30am Concurrent Breakout Session for at least three Working Groups (WG) and one WG for the trainees
Closed Session: for participants of the Symposium only
Three working groups with more focused topics will meet to discuss the availability and nature of relevant medical data, formulate specific clinical questions and begin to construct a pipeline for processing and analyzing the data. These groups will have a balance of clinicians/medical researchers and ML experts. After the conference, a Slack channel for each working group's project will be created and used to assign tasks and share findings.
WG1: Medical Imaging (Jim Min and Mert Sabuncu) – including but not limited to neuro, cardiac, lung and liver imaging
WG2: Computational Biology (Chris Mason and Haiyuan Yu) – including genetics and heritability

WG3: Medical Informatics (Curtis Cole and Marty Wells) – including electronic medical record data analysis
WG4: Trainees

List goals and discussion questions and leaders for each WG
The goals of each WG are to identify three or more "low-hanging fruit" projects of top priority that have readily available data that is acceptable in nature and quantity for applying ML algorithms.

1. For each project identified, please list the nature of the data (size, format, location, number of subjects etc), the clinical question(s) to be addressed.
2. For each project, list a few possible ML algorithm(s) that may be appropriate. Consider the goals of the project – are we more interested in prediction or understanding the system?
3. Specify the details of a successful outcome – what is the nature of the metric(s) that would help answer the clinical question? Would the outcome be binary/continuous/categorical?
4. How will answering this clinical question inform our diagnosis/prognosis/treatment of the disease in question?
5. Translation: How would we go about incorporating the outcomes of this project into clinical practice?
6. Theory: Is there room for development of a new ML approach that could be tailored to the data/clinical question?
7. Funding: What funding mechanisms are available for this particular project? Is the project more suited for the NSF or the NIH or both? Are there any specific RFAs for this type of project?

12:30pm Lunch

1:30pm Presentations/recommendations from individual WGs
Closed Session: for participants of the Symposium only

1:30pm	WG1 report/recommendations and ensuing discussion
1:45pm	WG2 report/recommendations and ensuing discussion
2:00pm	WG3 report/recommendations and ensuing discussion
2:15pm	Trainees WG report/recommendations and discussion

2:30pm Coffee Break

3:00pm Consensus development for overall recommendations and action items from the Symposium
Closed Session: for participants of the Symposium only

3:30pm Summary, Concluding Remarks, and Next Steps (Co-Chairs)

4:00pm Meeting adjourned
Bus from Lab of Ornithology to Gates Hall
Boxed meals for travellers to NYC

4:30pm Bus departure for NYC