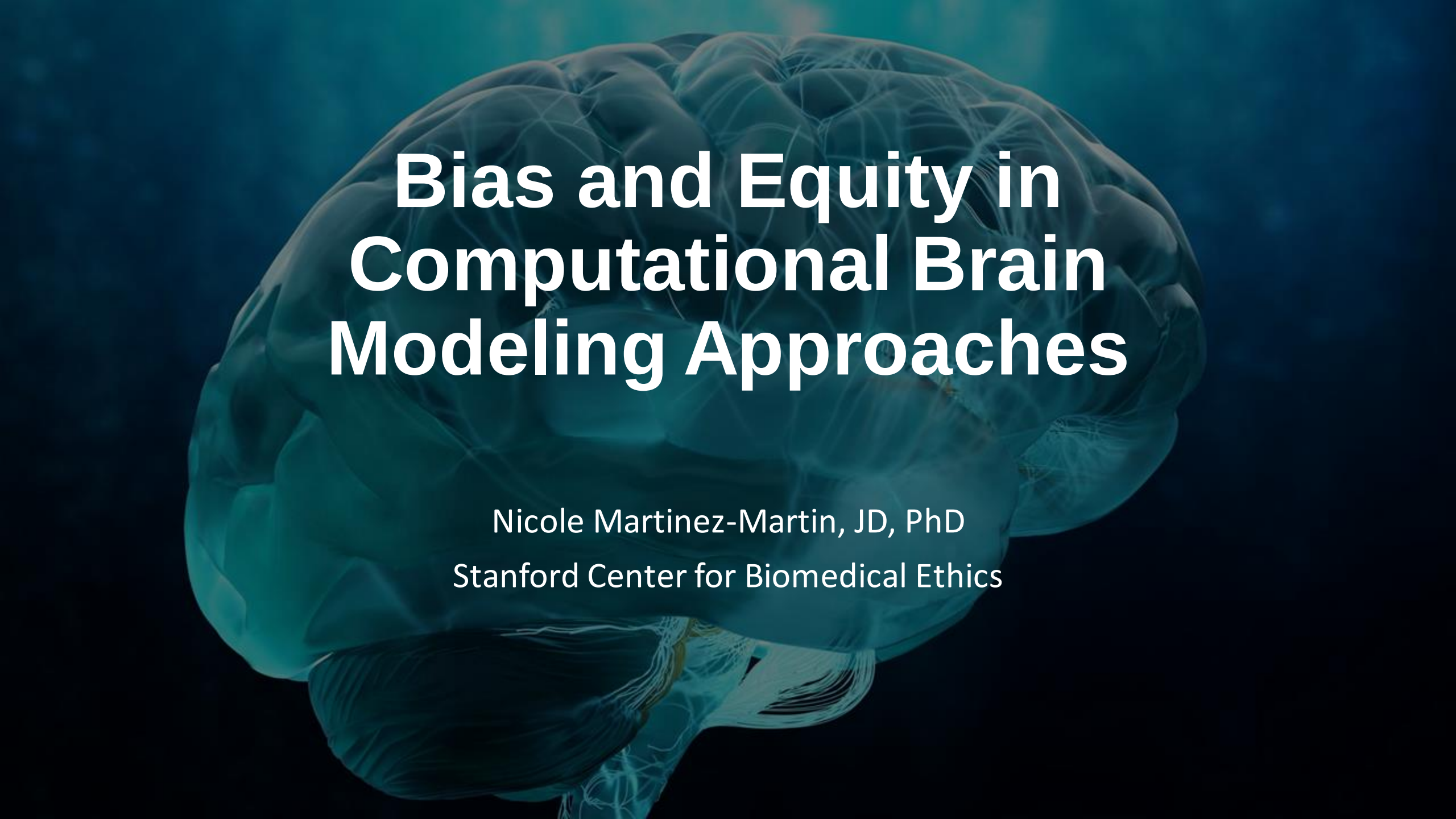

Bias and Equity in Computational Brain Modeling Approaches

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Introduction

- BRAIN Initiative investing in computational modeling approaches to neuroscience, such as Brain Behavior Quantification and Synchronization (BBQS).
  - Tools and models to capture complex, dynamic behavior-environment interactions, with the goal of advancing understandings of how the brain gives rise to complex behaviors, and to enable the development of interventions for neurological and neurodevelopmental disorders.
  - BBQS approaches will need to be compatible in “individuals across the lifespan,” for “diverse sociocultural settings” and for populations that have historically experienced health disparities.
  - As genomics and medical artificial intelligence (AI) research have shown, even with general support for projects that engage diversity and representation, there are often biases and unacknowledged assumptions that can impact the scientific validity and public benefit of the research.
  - BBQS research will potentially redefine what is considered “normal”, “abnormal” and species-typical behavior as well as lead to improved clinical treatments.

Attention to diversity and representation is important for achieving the goals of BBQS

- "Diversity" may be conceptualized and operationalized in different ways, including
  - Recruitment of participants or researchers according to racialized groups, culture, age, disability, and neurodiversity
  - Sustained engagement with historically underrepresented and marginalized groups
  - Focus on providing benefit for diverse populations or reducing harms to marginalized groups within technology
- Decisions made in BBQS projects, such as what behaviors will be measured and how, will have downstream impact on how the resulting tools, data and models provide benefits for diverse populations.

BBQS present novel challenges for representation and engaging diversity

- Multimodal datasets
  - Bringing together different datasets that each may have their own limitations in terms of representation
    - Example: AI/ML applied to schizophrenia research can lead to biased results if do not take into account how many datasets, including electronic health records, reflect overdiagnosis of schizophrenia for Black and Latine men due to social inequities and bias in physician diagnosis. In turn, those biased results can mean that resulting tools do not benefit, or even harm, these groups.
  - Sensor data – presents challenges regarding labeling and annotation of behavioral data across different cultures and marginalized groups
- Mapping behaviors across different populations and, at times, different species

Existing strategies for addressing bias/equity are limited – and will need to be adapted specifically for BBQS

- Need to better understand how representation/diversity concerns are operationalized in specific biomedical contexts
- PEDP is an emerging solution, but their impact & usefulness needs to be better understood
- To meet the goals of BBQS, a shared understanding of what is needed for accurate representation (or even what constitutes accurate representation[i]) of brain and behavior will need to be developed to address issues such as how data and conceptual models may be used across the different projects, species, and practices.

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