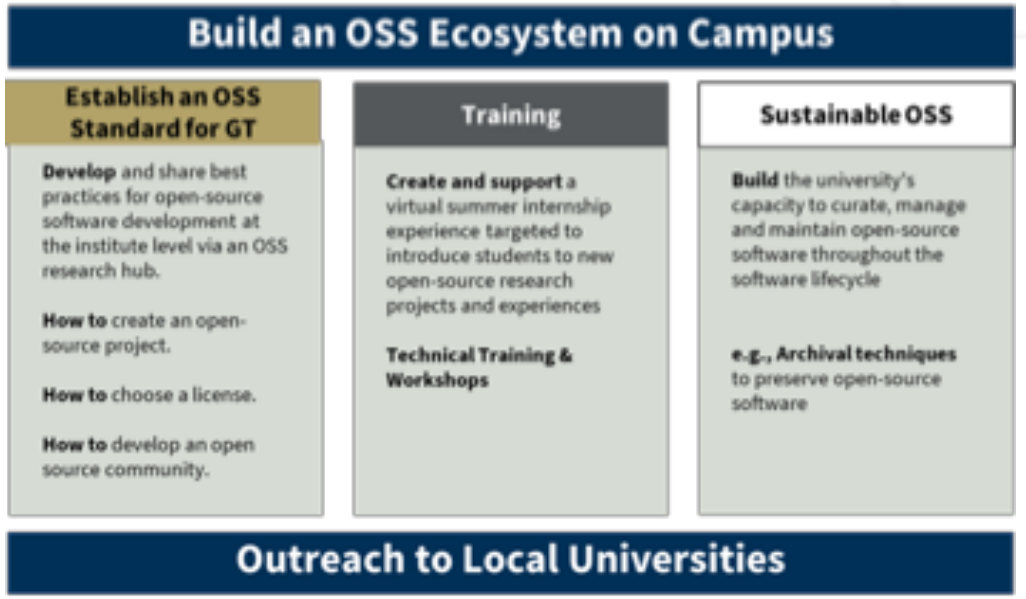
GT Open Source Program Office

Supports open source activities including

- Virtual Summer Internship Program for students (with IBM, 26 students & 14 projects in Summer 2024)
- Open-Source Project Explorer https://gt-ospo.github.io/oss-project-explorer/
- OSS Training https://github.com/gt-ospo/oss-training/
- Open Forum for AI
- Workshops (joint with CSSE)
- Licensing Guidelines

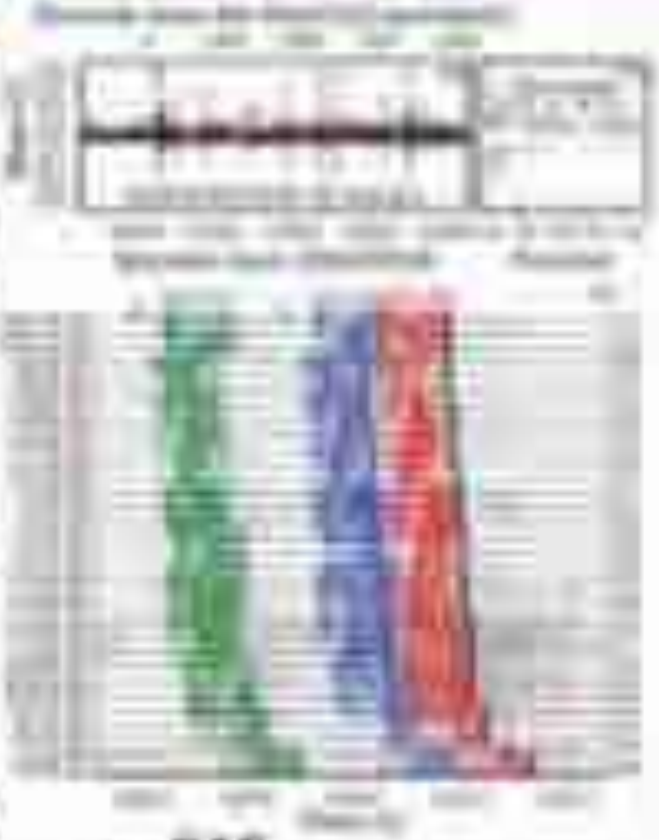


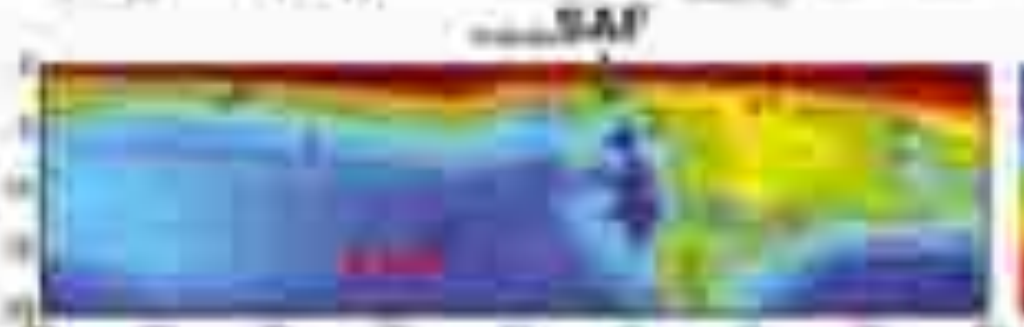
ospo.cc.gatech.edu

Georgia Tech Open Source Program Office

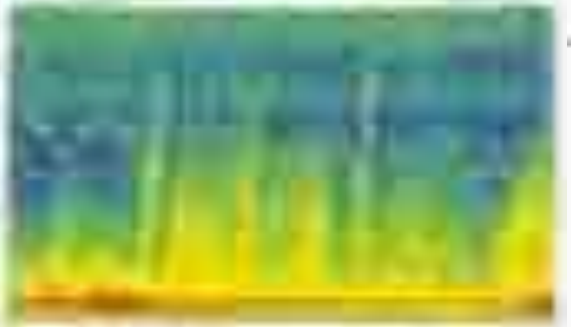
Earthquake and Environmental Seismology: Fault Zone Imaging, Earthquake Triggering, Machine Learning

Zhigang Peng (Georgia Tech, zpeng@gatech.edu)





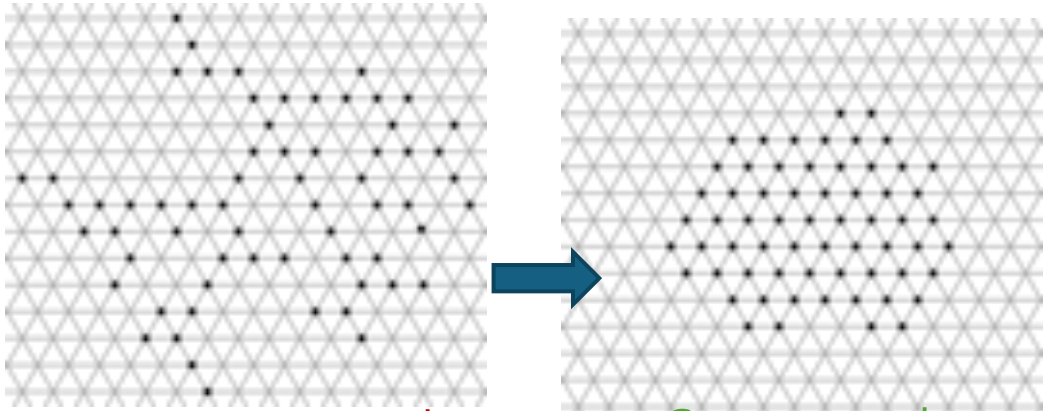
Earthquakes in Antarctica triggered by distant M8.8 Chile earthquake



Collective behavior

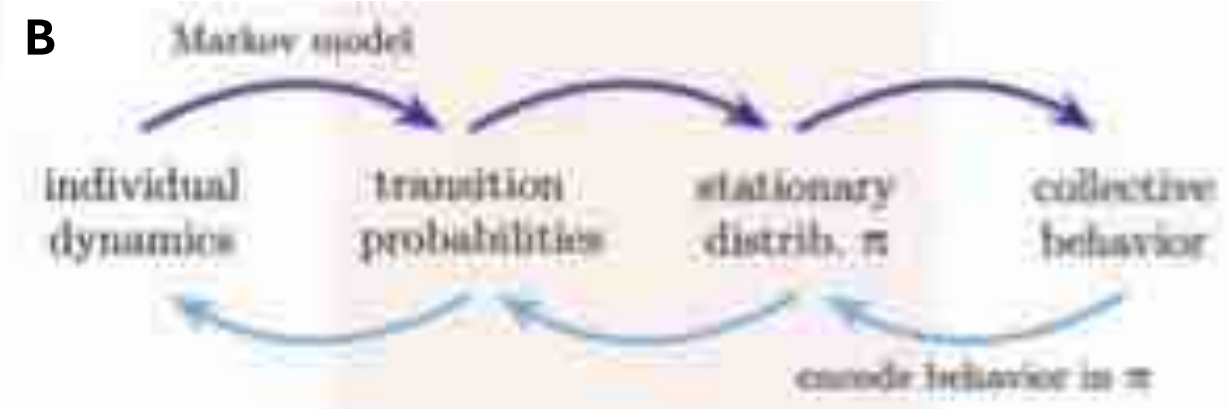
Dana Randall, CS

A



Not compressed Compressed

B

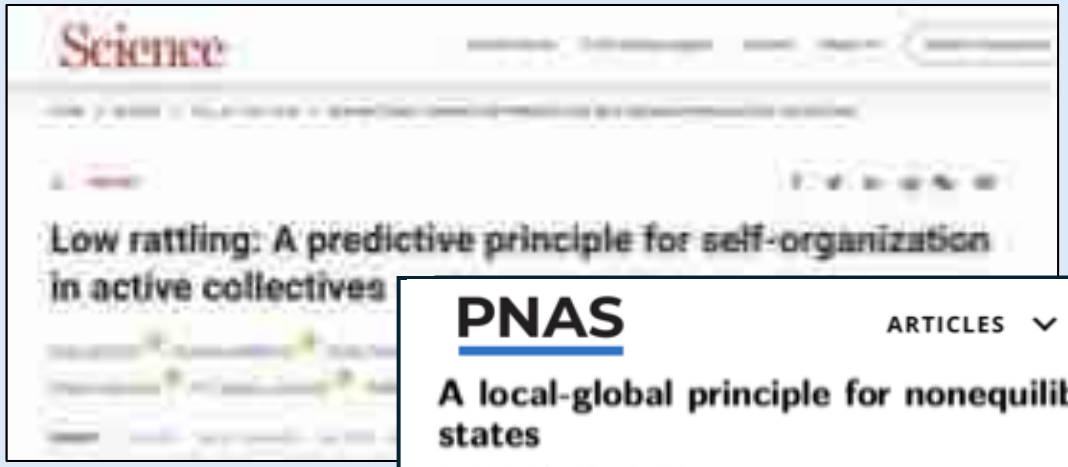


C

"BOBbots"

(with Daniel Goldman, Physics)

D *Nonequilibrium* collective behavior



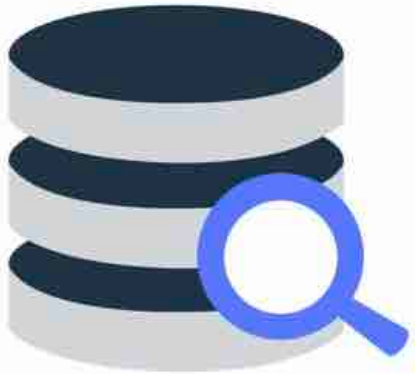
Contact: krong@gatech.edu; https://kexinrong.github.io/

Kexin Rong (School of Computer Science)

Research Area: Databases, Data Analytics Systems

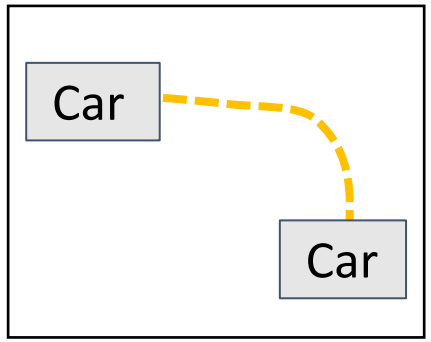
Product	Price	Qty
bagel	1	20
banana	0.5	10
banana	1	10
bagel	1.50	20

Database



```
SELECT SUM(Qty)
FROM sales
WHERE Product='bagel';
```

Find images with like this



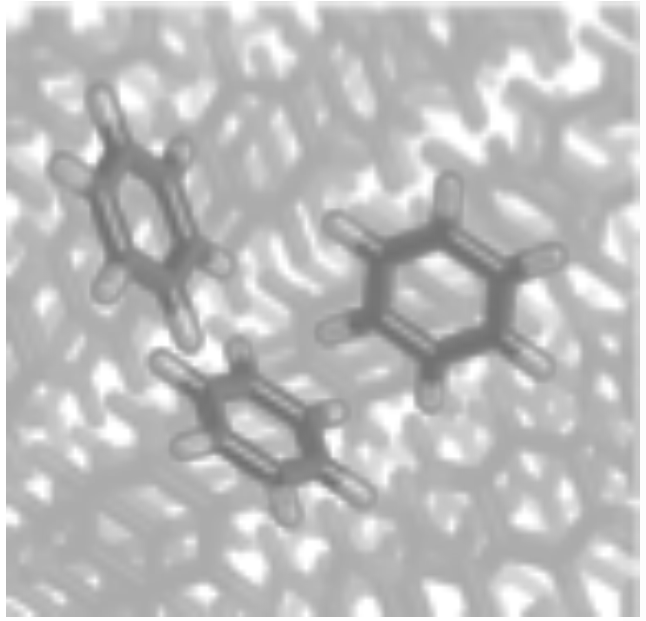
Find videos like this

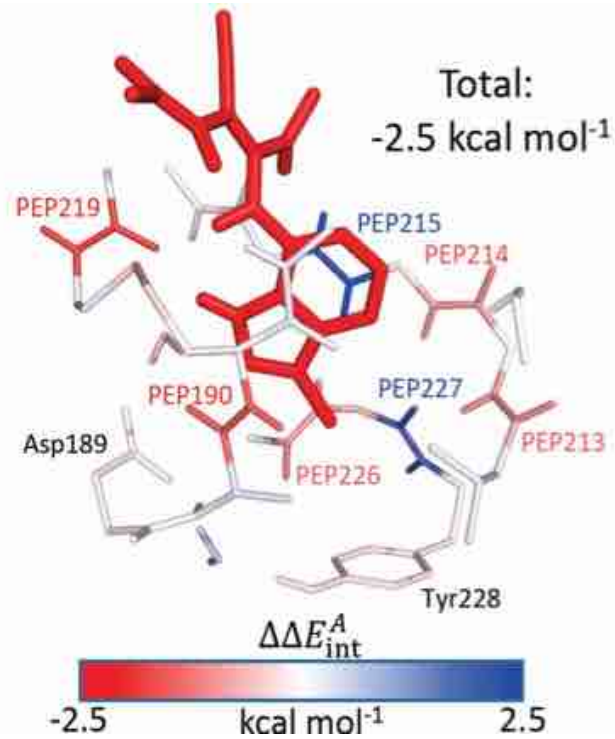
Find out when this earthquake reoccur

If you have lots of data, but find it hard to store, query, run analysis, let's talk!

Research Interests and Capabilities Sherrill Group

- High-accuracy quantum chemistry (methods, software, applications)
- Deep understanding of intermolecular interactions, and novel tools to compute them
- Protein-ligand interactions and molecular crystals
- High throughput quantum chemistry and machine learning models of intermolecular interactions





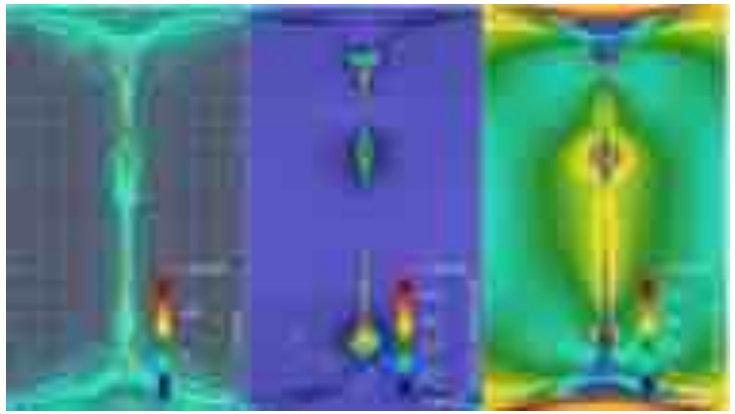
Human Neuromuscular Physiology Lab (PI: Shinohara)

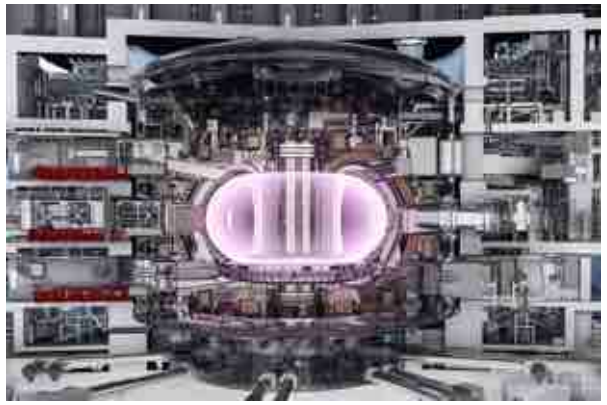
- Human subjects: Healthy, Aging, Parkinson's, Post-stroke, etc.
- Quantification of neuromotor control
  - Movement: Muscle force, muscle movement, joint movement
  - Mechano-signals: Force sensor, ultrasound, wearables, camera, VR goggle
  - Mechano-quantification: Strength, speed, accuracy, quality, artistry
  - Neuro-signals: EEG, ECG, EMG, motor unit discharges, pupil size
  - Neuro-quantification: Time-domain and frequency-domain analysis
- Interventions to improve/recover motor skills
  - Neural interventions (e.g., neurostimulation)
  - Mechanical interventions (e.g., robot)
  - Uniquely-designed exercise

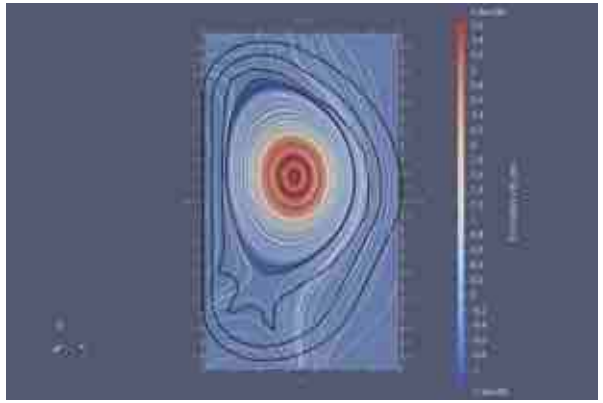
Qi Tang - Assistant Professor in CSE
HPC, scalable PDE solvers, scientific ML
Applied/comp math, fusion modeling, plasma physics

- Scalable solvers for magnetic confinement fusion modeling

Magnetic reconnection in extended MHD



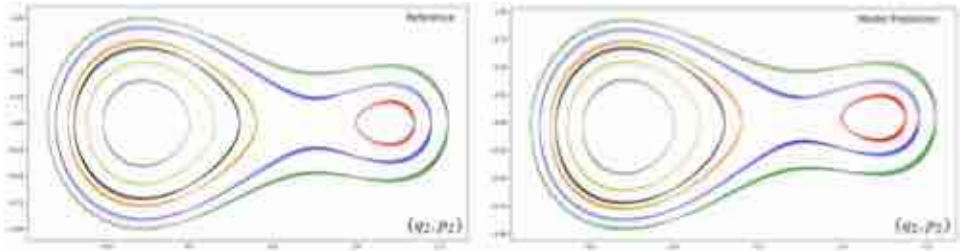




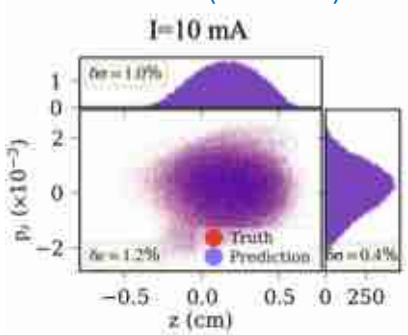
ITER whole device modeling

- Structure-preserving ML for dynamics

Symplectic NNs for multi-scale Hamiltonian

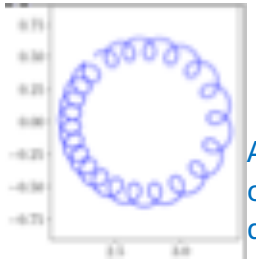


Stable ML surrogate for linear accelerator (LANSCE)



Explore low-dimensional structures in dynamical systems:

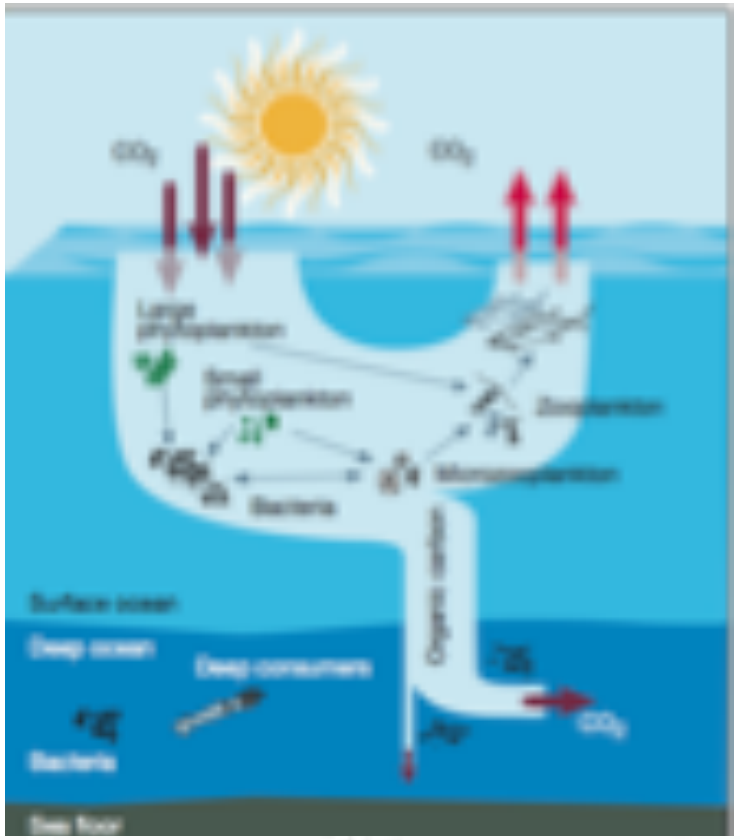
- Inertial manifold theorem
- Fenichel normal form

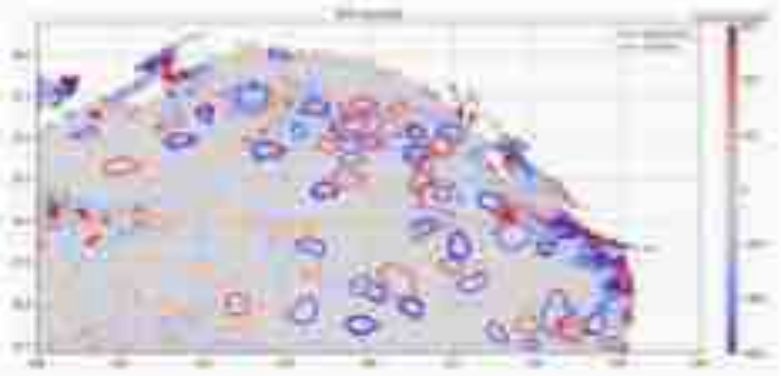


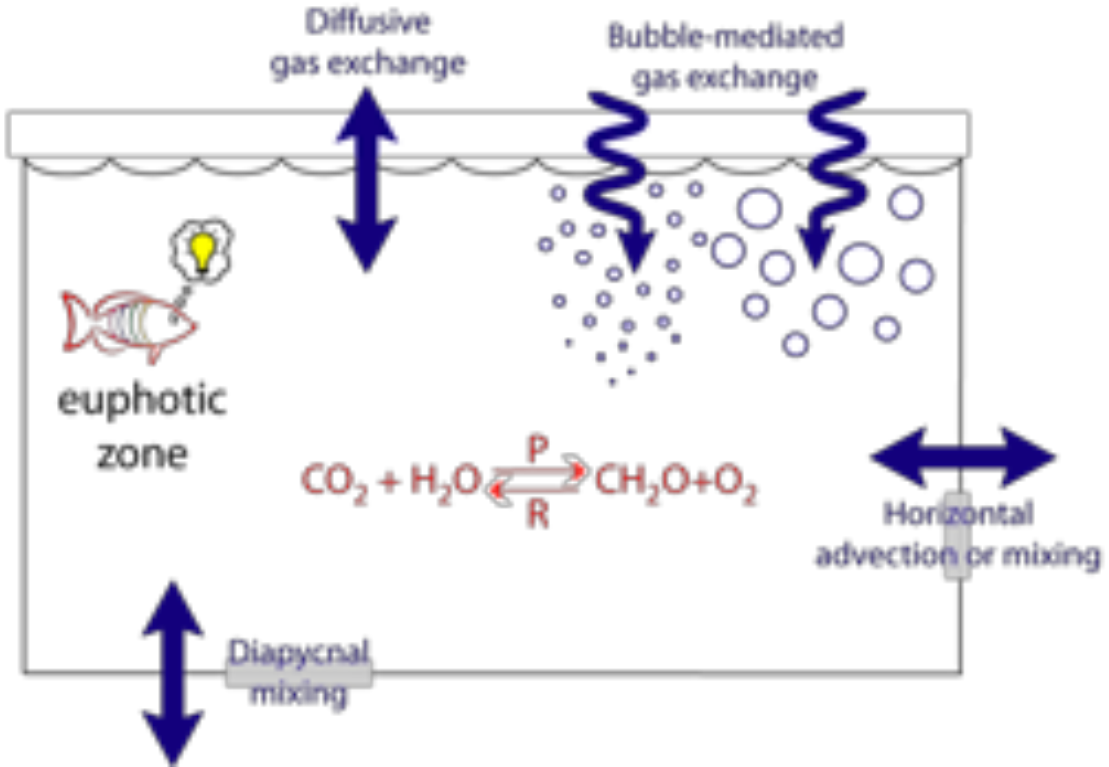
Asymptotic-preserving closure for multi-scale dynamical systems

Amanda Timmerman

Biological Carbon Pump

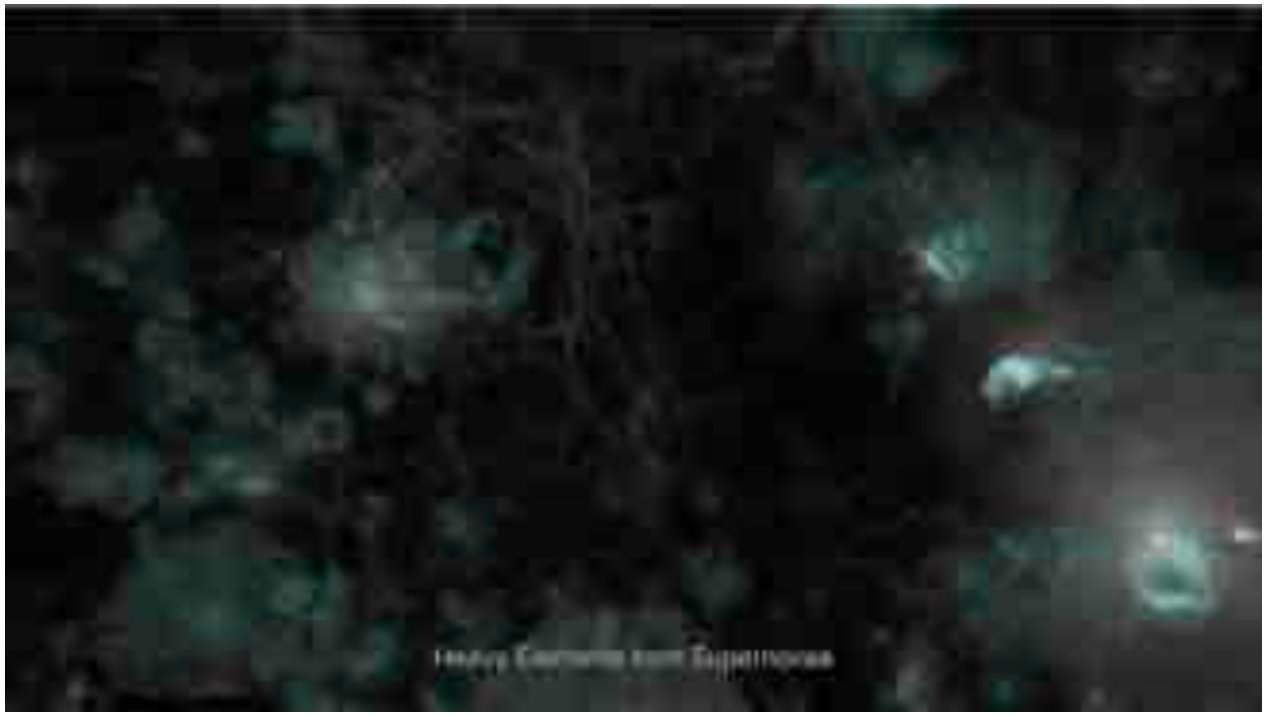






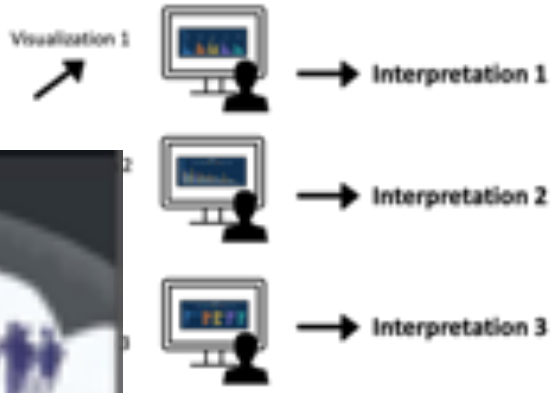
John Wise (Physics)
Computational Astrophysics

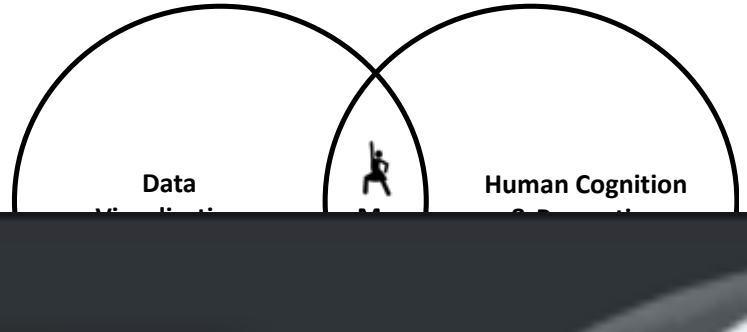
- CRA Director
  - Center for Relativistic Astrophysics
  - Part of GT Space Research Initiative
- HPC Cosmology Simulations
  - Interested in optimization
  - NSF Frontera & ACCESS
- Galaxy and Star formation
- JWST observations
- Radiation transport
  - Ray tracing & moment methods
- Physics ML emulators

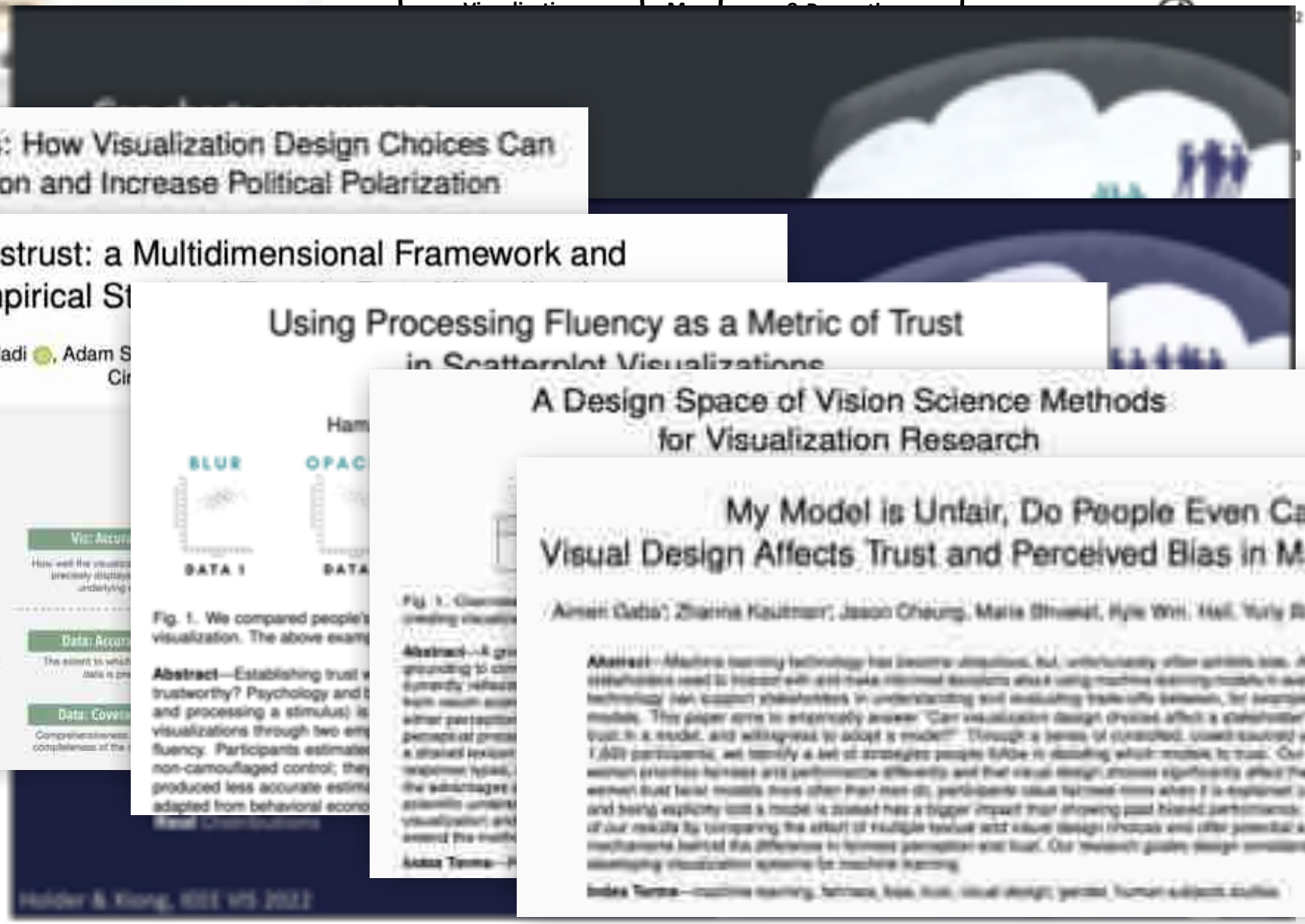


Georgia Tech

Designing a visualization involves **a series of decisions**, and each design decision can afford different interpretations.







Polarizing Political Polls: How Visualization Design Choices Can Shape Public Opinion and Increase Political Polarization

Vistrust: a Multidimensional Framework and Empirical St

Hamza Elhamdadi, Adam S

Using Processing Fluency as a Metric of Trust in Scatterplot Visualizations

Ham

BLUR

OPAC

DATA 1

DATA

Fig. 1. We compared people's visualization. The above exam

Abstract—Establishing trust trustworthy? Psychology and and processing a stimulus) is visualizations through two em fluency. Participants estimate non-camouflaged control; they produced less accurate estim adapted from behavioral econo

Individual Characteristics

Trust in Vis

Trust in Data

Vis: Accura

Data: Accur

Data: Covera

A Design Space of Vision Science Methods for Visualization Research

My Model is Unfair, Do People Even Care?
Visual Design Affects Trust and Perceived Bias in Machine Learning

Aimen Gaba, Zhanna Kaufman, Jason Cheung, Marie Shvakel, Kyle Wm. Hall, Yuriy Brun, and Cindy Xiong Bearfield

Abstract—Machine learning technology has become ubiquitous, but, unfortunately often exhibits bias. As a consequence, disparate stakeholders need to interact with and make informed decisions about using machine learning models in everyday systems. Visualization technology can support stakeholders in understanding and evaluating trade-offs between, for example, accuracy and fairness of models. This paper aims to empirically answer "Can visualization design choices affect a stakeholder's perception of model bias, trust in a model, and willingness to adopt a model?" Through a series of controlled, crowdsourced experiments with more than 1,000 participants, we identify a set of strategies people follow in deciding which models to trust. Our results show that men and women prioritize fairness and performance differently and that visual design choices significantly affect that prioritization. For example, women trust fairer models more often than men do, participants value fairness more when it is explained using bar charts rather than as a bar chart, and being explicitly told a model is biased has a bigger impact than showing past biased performance. We test the generalizability of our results by comparing the effect of multiple textual and visual design choices and offer potential explanations of the cognitive mechanisms behind the differences in fairness perception and trust. Our research guides design considerations to support future work developing visualization systems for machine learning.

Index Terms—machine learning, fairness, bias, trust, visual design, gender, human subjects studies

Holder & Xiong, IEEE VIS 2022

NLP X Research Lab

Georgia Tech | School of Interactive Computing
College of Computing

Wei Xu
Associate Professor
https://cocoxu.github.io/

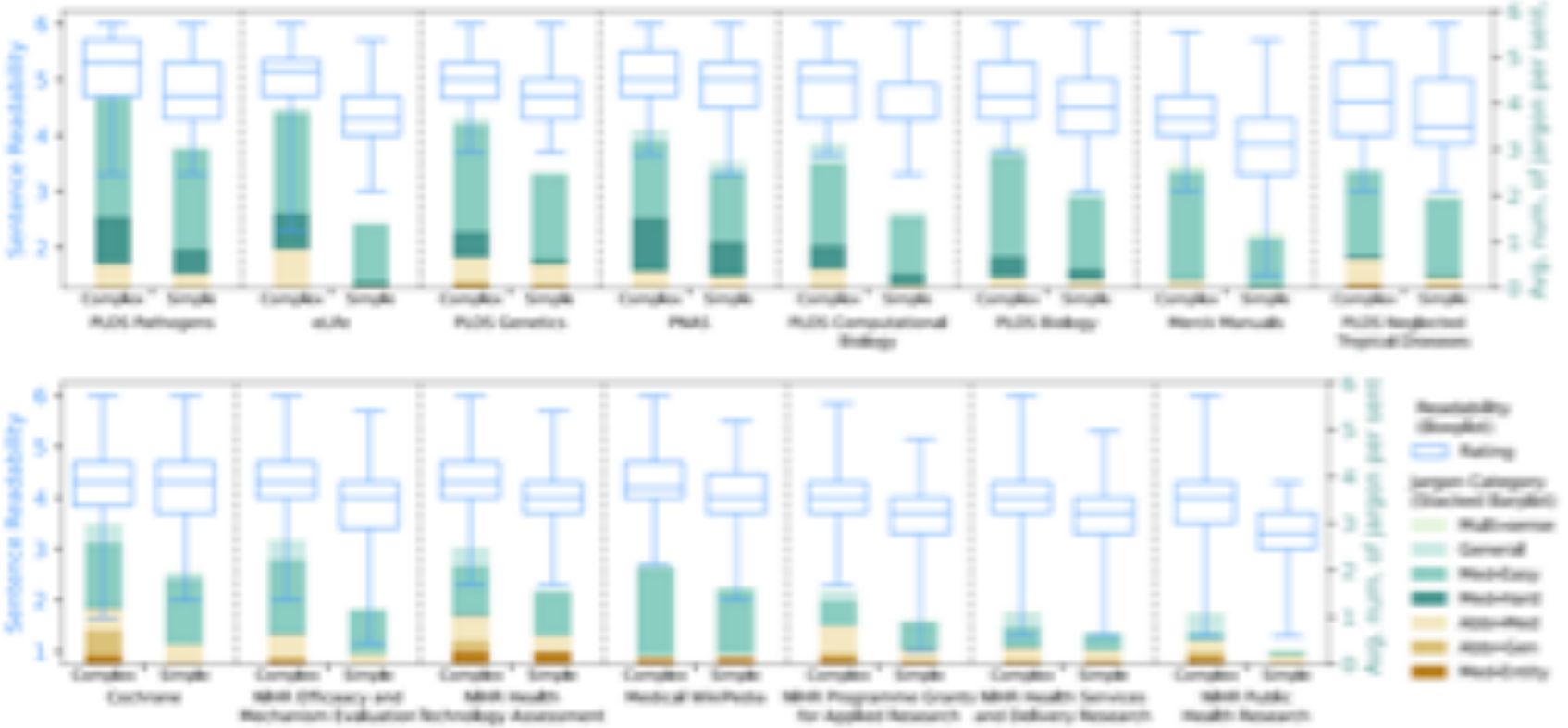
Large Language Models

- text generation
- information extraction
- chatbot
- reading/writing assistant
- multi-/cross-lingual capability
- privacy, safety

NLP+X Interdisciplinary Research

- Human-centered NLP
- Education, Accessibility, Law …
- Science & Healthcare

Chao Jiang, Wei Xu. "A Systematic Study for Fine-grained Sentence Readability in Medical Domain" (EMNLP 2024)



Georgia Tech Machine Learning

IARPA DARPA NIH

Google SONY criteo

IVI.Lab

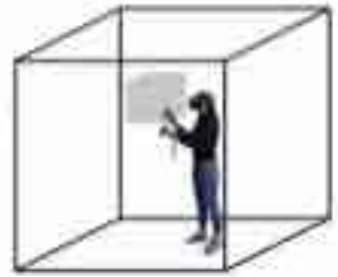
https://ivi.cc.gatech.edu/

VR/AR

Maps and Globes
EuroVis 18

Flow Maps
VIS 18

Tilt Map
TVCG 20



Navigation
VIS 20

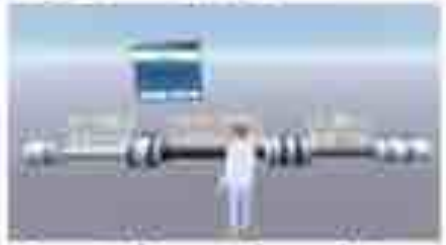
AR Label
TVCG 21

AR Training
CHI 21

Sport Embedded Vis
VIS 22

Cross-Device Vis
VR 23

Dynamic AR Label
VIS 23



One Dimensional Nav
ISMAR 23

Embodied Data Transformation
TVCG 23

Immersive Notebook
CHI 24

Saman Zonouz

CPSec: Cyber-Physical Systems Security Lab
School of Cybersecurity and Privacy

- Research
  - Cyber-physical systems security
  - Critical infrastructure resilience
  - healthcare, medical devices, biological processes (CRISPR, biomanufacturing)

- Prior recent efforts
  - GT seed project on trustworthy and AI-enabled tissue manufacturing

- Fun fact: I was officially an undergrad biology student until recently (while being a faculty).
  - took many courses for credit: gen bio/chem 1-2, genetics, psychology, cell foundation, etc.
  - worked at NYGC on CRISPR off-target activity prediction

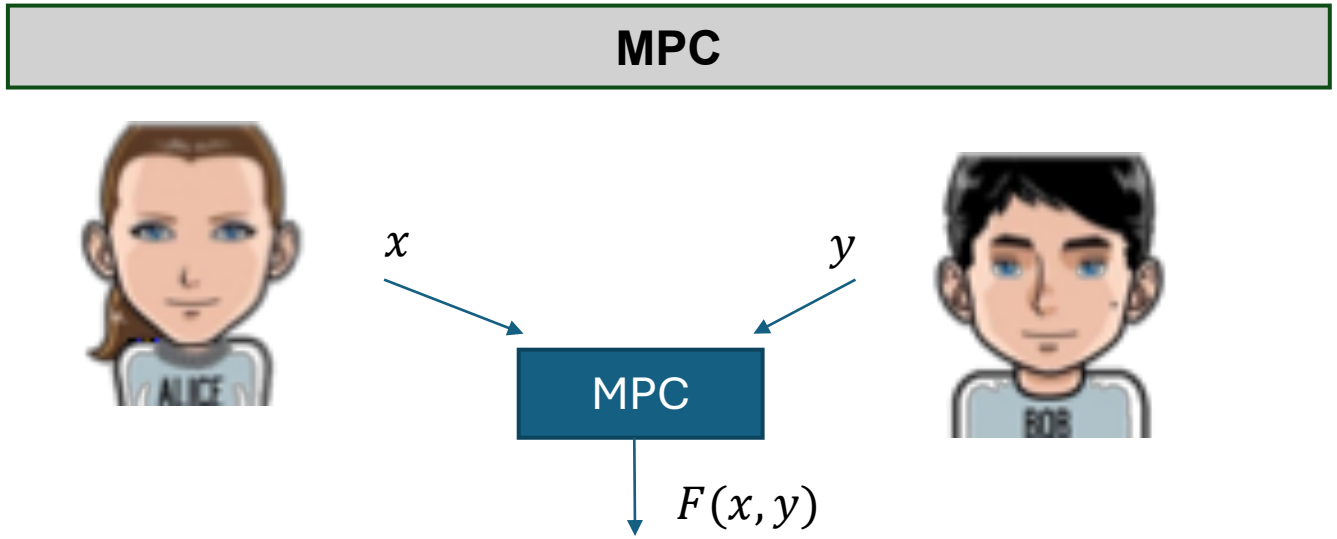
CPSec: Cyber-Physical Systems Security Lab

Amy Bruckman
School of Interactive Computing

- Interests in:
  - Online collaboration
  - Content moderation
  - Social movements
  - Computer-Supported Cooperative Work (CSCW)
- Qualitative research and mixed-methods
- Current projects:
  - Why do men participate in misogynist hate groups online?
  - Can better communication technology help service-industry workers? Can we foster worker mutual aid?

Practical Secure computation (MPC) & Zero Knowledge (ZK) & Post-Quantum

Vlad Kolesnikov



Who are Alice and Bob?

Healthcare, Telcos, IoT, Cloud, Supply Chain, Automotive …
Want to share data.
Concerns of: IP, legislation, user agreements, PR…

Practicality:

- Can implement functions in C-like language
- working on full ANSI C
- Efficiency goal: drop-in replacement in existing workflow.

Example tasks:

- Location-based services
- Privacy-preserving querying
- Vehicles coordinating privately
- Internet routing / BGP negotiation
- IoT private reporting/spot pricing/auctions

CoS lunch with CC - October 11, 2024

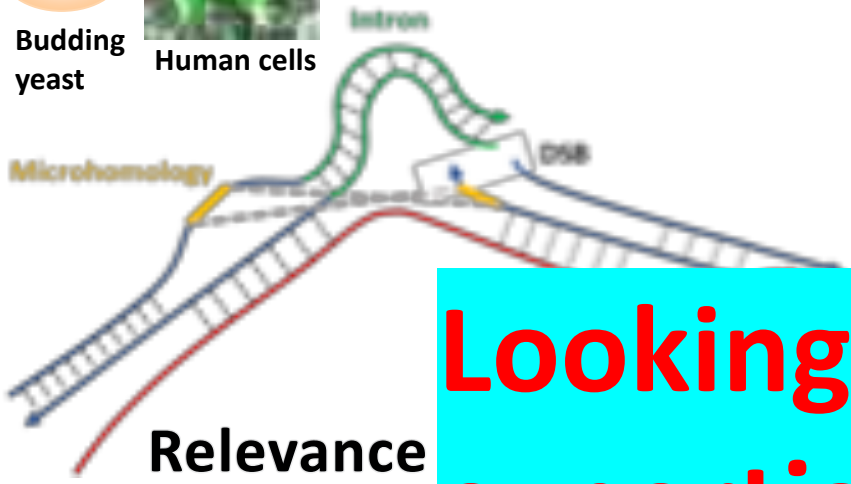
Research expertise of Francesca Storici's group

Georgia Tech School of Biological Sciences

RNA-mediated DNA double-strand break (DSB) repair

Budding yeast

Human cells



Storici, et al., *Nature* 2007

Keskin, et al., *Nature* 2014

Meers, et al., *DNA Repair* 2016

Mazina, Keskin, et al., *Mol. Cell* 2017

Michelini, et al., *Chem. Rev.* 2018

Looking for machine learning expertise to detect rNMPs in DNA using Nanopore sequencing

Relevance

Developed tool

Nat. Commun. 2020

Gombolay, et al., *Nucleic Acids Res.* 2019

Gombolay and Storici, *Nat. Protoc.* 2021

Xu and Storici, *Nucleic Acids Res.* 2021

Xu and Storici, *Theoretical Computer Science* 2021

Kundnani, et al., *iScience* 2024

Xu & Yang, et al., *Nucleic Acids Res.* 2024

Yang & Sun, et al., *Bioinformatics Advances* 2024

NIH NATIONAL CANCER INSTITUTE

NSF

SF

Tom & Marie Patton Distinguished Professor

Southeast Center for Mathematics and Biology

SCMB

Thank You!

Please take a few minutes to give us your feedback here (it's anonymous):

CoC + CoS Luncheon Mixer Feedback Survey

Georgia Tech