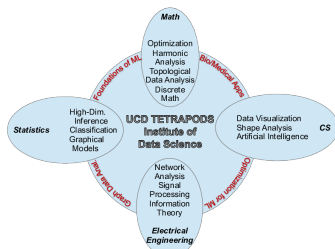


UCD4IDS: Current Status & Future Plans



Naoki Saito

Department of Mathematics
University of California, Davis

MADDD Seminar
March 29, 2022

Outline

- 1 The UCD4IDS Current Status
- 2 Campus-wide Data Science/AI Status
- 3 What I learned at École Normale Supérieure?
- 4 Help and Suggestions Needed!

Acknowledgment

- NSF HDR-TRIPODS Grant: CCF-1934568
- co-PIs: Nina Amenta (CS); Chen-Nee Chuah (ECE); Thomas Lee (Stat)
- Steering Committee: Alex Aue (Stat); Jesús De Loera (Math/GGAM); Zhi Ding (ECE); Patrice Koehl (CS)
- Thomas Strohmmer (Director, CeDAR)
- Kim Turner (Director, Space Management and Project Development)
- All the members of the UCD4IDS

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The UCD4IDS Research Themes

- 1 Fundamentals of machine learning directed toward biological and medical applications
- 2 Optimization theory and algorithms for machine learning including numerical solvers for large-scale nontrivial learning problems
- 3 High-dimensional data analysis on graphs and networks

The objective of the UCD4IDS is to *cross interdepartmental barriers and promote interdisciplinary research collaborations among faculty members, postdocs, and graduate students.*

Member Recognition (since 10/01/2019)

- Jesús De Loera (Math) elected as a vice president of the AMS (2022-2025)
- Prabir Burman (Stat) elected as a 2021 IMS Fellow
- Nina Amenta (CS) won the 2021 Outstanding Faculty Award for Excellence in Teaching, UCD College of Engineering
- Rishi Chaudhuri (Math/NPB) won 2021 Sloan Research Fellowship
- Zhi Ding (ECE) & Patrice Koehl (CS) won 2020–21 Graduate Program Advising and Mentorship Awards, UCD Office of Graduate Studies
- Zhi Ding (ECE) won 2020 IEEE Communications Society Education Awards
- Chen-Nee Chuah (ECE) awarded the Child Family Professorship in Engineering
- Ilias Tagkopoulos (CS) won the NSF National AI Institutes grant and established the *AI Institute for Next Generation Food Systems* (AIFS)
- Jesús De Loera (Math) awarded 2020 INFORMS Optimization Society Farkas Prize
- Chen-Nee Chuah (ECE) & Jesús De Loera (Math) received 2020 ADVANCE Scholar Awards
- Nina Amenta (CS) won a 2020 Test of Time Award for her 2001 paper on Computer Analysis of Real-world Objects from Journal: Computational Geometry
- Mariel Vazquez (Math) elected as a 2020 AMS Fellow
- Jiming Jiang (Stat) & Thomas Lee (Stat) elected 2019 AAAS Fellows

The Past and Current Activities

- Have 35 faculty members (CS: 5; ECE: 4; Math: 11; Stat: 15)
- Hired cumulatively four postdocs
 - ▶ Abhishek Roy (Stat): Jul. 2020 – Jun. 2021 (50%) ⇒ UCD CS
 - ▶ Chao Wang (ECE): Jul. 2020 – Jun. 2021 (100%) ⇒ Assistant Professor, Southern Univ. of Science and Technology, Shenzhen, China
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- The campus High Performance Computing (HPC) Core Facility plans to build a new cluster in the Data Center, which will include GPU resources
- Both UCD4IDS and CeDAR *purchased 1,000,000 priority points* each using \$10K budget, which allow our members to access the GPU environment for five years
- That cost also contributes to upgrading the existing GPUs
- No need to worry about its maintenance, inventory, warranties, and other paperwork; the HPC personnel take care of these
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04/19	<i>G. Arvanitidis (TUD, AM/CS)</i>	04/20	<i>Berkeley-Davis Seminar</i>
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05/24	TBA	05/26	<i>Stephen Stigler (U. Chicago)</i>
05/31	TBA	06/02	TBA

- How can we engage seminar participants more?
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 - How about an internal workshop in September 2022 before the fall quarter starts (mainly talks by supported graduate students and postdocs)?
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 Foundations of DS/AI among CS, ECE, Math, Stat

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 Director: Thomas Strohmmer (Math)
 Research on wide range of DS/AI through interdisciplinary collaboration
 between DS/AI scientists and domain experts

AIFS AI Institute for Next Generation Food Systems
 Director: Ilias Tagkopoulos (CS)
 Multi-university effort on more specific area of DS/AI

DataLab Executive Director: Carl Stahmer (English)
 Training & research support for campus-wide DS/AI activities

HSI-SIS Director: Damon Tull (Graduate School of Management)
 NSF HSI Strategic Innovation Summit for Advanced Research and
 Instruction in Artificial Intelligence and Quantum Information Sciences
 Focusing on research and education strategies in AI/QIS for
 underrepresented groups

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DataLab Executive Director: Carl Stahmer (English)

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HSI-SIS Director: Damon Tull (Graduate School of Management)

NSF HSI Strategic Innovation Summit for Advanced Research and Instruction in Artificial Intelligence and Quantum Information Sciences
Focusing on research and education strategies in AI/QIS for underrepresented groups

... *There may be other groups. Please let me know if you know any!*

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Campus Space for Data Science Activities

- In Dec. 2020, Provost Mary Croughan appointed me as a member of the Project Implementation Committee for the PSEL Renovation 2020 Project (Co-chairs: Tracy Ligtenberg & Kim Turner).
- The 1st floor and part of the basement of the PSE Library will eventually become available for our data science activities (UCD4IDS, CeDAR, AIFS and a couple of rooms for DataLab).
- Design Build teams have been qualified. Four teams are proceeding through the competition phase to final selection which is expected in May 2022.
- Once the final selection is made, the team will prepare both demolition plans and new construction plans. Demolition is expected to start in summer 2022 and construction will conclude in late spring 2023.
- Upon construction completion, furniture installation and move will take a few weeks with occupancy expected in early summer 2023.
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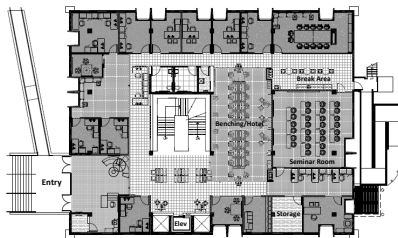
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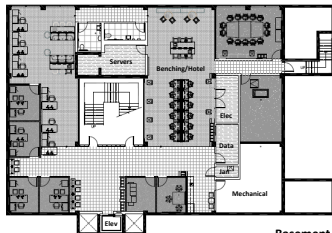
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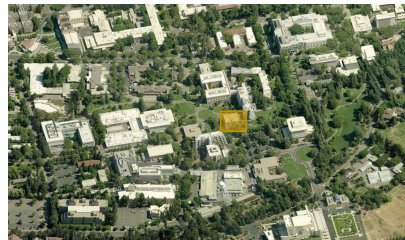
Physical Sciences & Engineering Library (PSEL) Renovation 2020



First Floor



Basement



Renovate approximately 16,000 square feet of the Physical Sciences Engineering Library at the presently vacant basement and 1st floor to provide offices, teaching and meeting rooms for growing programs associated with data sciences and artificial intelligence.

Approval to
begin
Preliminary
Plans

11/20/2020

Approval for
Budget, Design &
Environmental

9/21/2021

Chancellor's Committee on Campus Planning and Design

September 21, 2021

Fact Sheet

Project Goals

Provide offices, study and teaching space for data science related research programs.

- As part of the College of Letters and Science, house the Tetrapods Institute for Data Science (TETRAPODS) and the Center for Data Science and Artificial Intelligence Research (CeDAR). As well, provide space to support the new Data Sciences major.
- Create a home for the newly formed AI Institute for Next Generation Food Systems (AIFS) and an emerging cyber security AI research group.
- Retain a footprint for the University Library for satellite Data Lab offices.

Project Scope

- Retain existing offices and meeting rooms and construct new offices, classroom and break out rooms to support program needs.
- Improve existing building's compliance with life safety, energy, and accessibility codes and include abatement and installation of new HVAC, updated electrical, and retrofitted elevator.

Environmental and Sustainability

- The project qualifies as CEQA categorical exemption.

Budget and Funding

- Total Project Cost: \$7,500,000
- Funding Plan: Campus Funds with external financing

Building Area

- Existing Building: 32,000 gsf
- Renovation Area: 16,000 gsf

Design Team

- Architect, Pressey & Associates

Outreach/Participation

Implementation Committee

The Implementation Committee provides oversight on the project.

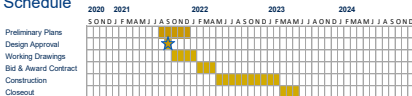
- College of Letters & Science: Tracy Ligtenberg, Scott Slayton, Naoki Saito
- University Library: Carl Stahmer
- Office of Research: Paul Dodd
- Design and Construction Management: Kim Turner, Julianne Nola, Eric Paulantonio
- Facilities: John Zertuche
- Campus Planning: Lucas Griffith

Working Group

Breakout working group for input into detailed requirements of the renovation.

- TETRAPODS Institute for Data Science: Naoki Saito
- Center for Data Science and Artificial Intelligence Research (CeDAR): Thomas Strohmer
- AI Institute for Food Systems (AIFS): Steve Brown
- Statistics (Data Science Major): Alexander Aue
- Data Lab: Carl Stahmer, Oliver Kreylos
- Computer Science: Kwan-Liu Ma
- High Performance Computing Center: John Conway
- IET: Cheryl Washington, Mark Redican, Tara Kelly
- Letters and Science: Tracy Ligtenberg, Scott Slayton
- Design and Construction Management: Kim Turner, Eric Paulantonio

Schedule



UC Davis Data Science Majors

- UC Davis will debut its new interdisciplinary *data science major* in Fall 2022 (more about this in the next page)
- Currently, CS, ECE, Math, and Stat departments have their own undergraduate courses (mostly for *upper division*) on data science or closely related fields. See [the UCD4IDS website](#) for all those courses (totally 27 such courses)
- Example Courses in Math: We have been experimenting in MAT 167 (Applied Linear Algebra) and MAT 170 (Mathematics for Data Analytics & Decision Making) with project-driven data science education, where the students have to deal with real data and take on some computational tasks. The students have several projects with data and we followed the model of an MBA instruction, where they look at real cases to learn skills.

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New Data Science Major

- Curriculum organized into four initial tracks:
 - ① Foundations
 - ② Agricultural and Environmental Sciences
 - ③ Biological Sciences
 - ④ Social Sciences
- Student learning is focused on individual track goals
- Majors in every track to receive *ethics training*
- Majors in every track must take some foundational courses in CS, Math, and Stat, e.g., MAT 19 sequence (Calculus for Data Analysis)
- Predicted enrollment after two years is 600 majors
- Foundational lower division courses: MAT 19 series is the new course series that we plan to offer starting 2022, replacing the current MAT 16 (many soc. sci. ag. students take). This includes a *lab* which would require some basic *programming* and provide some *taste* of what it is like to analyze *real data*.
- A challenge: how to select and prepare appropriate and relevant data analysis problems and projects for lower division DS/AI students

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- Strongly dependent on faculty members advising students who are interested in DS
- *Leveraging institutional competencies:*
 - ▶ Natural emphasis on DS/AI directed toward biological/medical applications
 - ▶ Interaction with Dry Area high-tech companies
 - ▶ Seminars and colloquia reflecting these advantages
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- 1 The UCD4IDS Current Status
- 2 Campus-wide Data Science/AI Status
- 3 What I learned at École Normale Supérieure?**
- 4 Help and Suggestions Needed!

École Normale Supérieure (Ulm)



(a) ENS History



(b) Naoki at ENS's famous fountain

École Normale Supérieure (Ulm)



(a) Lagrange, Cauchy, and Poisson



(b) Louis Pasteur's Laboratory

Centre des Sciences Donée (CSD) @ ENS

Consists of

- Five Group Leaders
 - ▶ Guilio Biroli (Phys): ML via Statistical Physics
 - ▶ Olivier Cappé (CS): ML; Statistics; Signal Processing
 - ▶ Emmanuel Dupoux (Cog.Sci/Psych): Language Acquisition; Cognitive ML
 - ▶ Stéphane Mallat (CS/Math): Appl. Comput. Harmonic Anal.; ML; DS
 - ▶ Gabriel Peyré (Director; Math): Optimal Transport; ML
- 6 Part-Time Members
- 4 External Visitors
- 3 Invited Professors (including myself)
- 10 Postdocs
- 24 Graduate Students
- 7 Engineers

Centre des Sciences Donnée (CSD) @ ENS ...

- Got funding from industry
- Seminars:
 - ▶ Data Science Colloquium (monthly)
 - ▶ CSD Seminar (weekly)
 - ▶ PhD Seminar (weekly)
 - ▶ More specialized seminars run by each group (\approx weekly)
- Organize *Random Lunch* every other week (paid by the CSD)



(a) CSD Conference Room Fresco



(b) CSD Conference Room Plate

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Help and Suggestions Needed!

- Let's exchange our ideas to promote more collaborations among our UCD4IDS members.
- What would be good mechanism to get some budget for lunches and internal workshop receptions among our members?
- Let me know if you organize any *workshops*, *special seminars*, or *reading seminars/journal clubs* related to DS/AI!
- Any inputs and suggestions are always more than welcome!