

JACOBS SCHOOL OF ENGINEERING Corporate Affiliates Program

## Welcome CAP Executive Board October 7, 2021

## **CAP** Chairman and Vice Chairman



**GB Singh** Director, Business Management Solar Turbines



#### John Black

Senior Vice President, New Product Development Brain Corporation

#### Welcome





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## **Meeting Protocol**

- → We will be recording this meeting
- → Turn on video
- → Mute all, use chat for comments
- → Use "raise hand" for questions





## UC San Diego

JACOBS SCHOOL OF ENGINEERING Corporate Affiliates Program

## Agenda

CAP Executive Board Chairman Welcome 4:00-4:15pm Team Internship Program (TIP) Presentation: Solar Turbines TIP Team 4:15-4:25pm 4:25-4:35pm Dean's Report 4:35-4:50pm Franklin Antonio Hall: An Innovation Ecosystem Zachary Smith Executive Director of Development, Jacobs School of Engineering The Institute for Learning-enabled Optimization at Scale (TILOS) 4:50-5:10pm Dr. Andrew Kahng Director, TILOS Professor, Computer Science & Engineering 5:10-5:30pm CAP Business Adjournment 5:30pm



Corporate Affiliates Program

JACOBS SCHOOL OF ENGINEERING

## Welcome New CAP Partners











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Welcome Guests

APPLE LOCKHEED MARTIN

BECHTEL

MATHWORKS

CANTO

**NVIDIA** 

#### IMAGINATION TECHNOLOGIES

INTEL

### PALL AEROSPACE TECHNOLOGY

SINGULAR GENOMICS

VMWARE



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## **Welcome Solar Turbines TIP Team**

## Investigation and Improved Maximum Power Algorithm

# **Solar<sup>®</sup> Turbines**

A Caterpillar Company

## Dean's Report



## Albert P. Pisano

Dean, Jacobs School of Engineering

**Full Speed Ahead** 



JACOBS SCHOOL OF ENGINEERING Corporate Affiliates Program

#### Full speed ahead: students are back!

#### Welcome to the new Academic year!

- More than 9,400 engineering students ascend to the Jacobs School of Engineering
- In 2013 we set the goal to bring our faculty to student ratios 20:1 Undergrad, 10:1 Graduate
- We have nearly achieved this mission; 25:1 Undergrad, 12:1 Graduate



#### **Graduate students honored as Siebel Scholars**

On a mission to pioneer tools to improve the Human Condition:

- Graduate students working at the interface of engineering and medicine.
- Rare genetic disorders, microbial study of cancer, non-invasive wearable biosensors, physics of cell membrane deformation, and non-invasive cardiovascular evaluation
- Representing Electrical Engineering, Bioengineering, Nanoengineering and Bioinformatics



#### We continue to build cachet

#### UC San Diego

## BIOINFORMATICS RANKS #1 IN THE NATION

US NEWS 2022 BEST COLLEGES RANKING; UNDERGRADUATE COMPUTER SCIENCE: BIOINFORMATICS/BIOTECHNOLOGY PROGRAMS

#### The Jacobs School is ready to accelerate

## We hired 27 new faculty in 2020/2021

### Over 140 new faculty hired in 8 years, 281 total faculty



#### New major grant wins

#### \$20M NSF grant creating The Institute for Learning-enabled Optimization at Scale (TILOS)

- Institute Director: Andrew Kahng, CSE & ECE
- Develop learning-enabled optimization tools for application areas of strategic importance to the United States, including chip design, robotics, and communication networks.



\$12.25M NIH grant to develop and enhance brain-sensing and brain-stimulating platform technologies to enable treatment of drug-resistant epilepsy

- Project Lead: Shadi Dayeh, ECE, Integrated Electronics & Biointerfaces Laboratory
- Refine high-density sensor grids that more accurately identify seizure spots in brain



#### **Gordon Center Reboot - 2.0 Coming Soon!**

# UC San Diego

#### **JACOBS SCHOOL OF ENGINEERING**

Gordon Engineering Leadership Center





#### ServiceNow Terrace in Franklin Antonio Hall



servicenow

• Executive Outreach Center Terrace will be named "ServiceNow Terrace"

• Joins fellow CAP Partners Cubic, Qualcomm, and Teradata in naming spaces in Franklin Antonio Hall

• Special Thanks to ServiceNow CAP Executive Magaly Drant for championing this opportunity

## Special Presentation: Franklin Antonio Hall



## Zack Smith

Executive Director of Development, Jacobs School of Engineering



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### Franklin Antonio Hall: An Innovation Ecosystem





## Franklin Antonio Hall: An Innovation Ecosystem

### Franklin Antonio Hall Translational Vision for the Digital Future















### 1<sup>st</sup> Floor: Opportunities and Thanks



#### Named Spaces:

- Teradata Classroom
- Qualcomm Classroom
- Qualcomm Student **Project Space**
- Minerva's Café
- **Charles Lee Powell** Café Terrace

#### Available Spaces:

- 1. Learning Innovation Studio
- Institute for the Global 2. Entrepreneur Suite
- 3. **Open Seating Space**
- Lobby Atrium 4.
- Event Lobby 5.

### Learning Innovation Studio



## Learning Innovation Studio



## **Open Seating Area**



### **Institute for the Global Entrepreneur**



## 2<sup>nd</sup> Floor: Opportunities and Thanks



#### Named Spaces:

- Sanjay and Fiona Jha Collaboratory
- 2. Cubic Collaboratory
- Jack Wolf Meeting Room
- Founder's Conference Room

#### Available Spaces:

- 1. Center for Engineered Natural Intelligence Collaboratory
- 2. Halıcıoğlu Data Science Institute Collaboratory
- 3. Open Seating Space
- 4. Offices
- 5. Kitchenette
- 6. Lounge

## Meeting Room



## **3<sup>rd</sup> Floor: Opportunities and Thanks**



#### Named Spaces:

. Xiaosong Jiang and Paul Yu Meeting Room

## 4<sup>th</sup> Floor: Opportunities and Thanks



## **Executive Outreach Center/Terrace**



### **Executive Outreach Center Classroom**



#### **Enable Use-Driven Research in Research Centers of Excellence**



### **Executive Outreach Center Boardroom**



### Franklin Antonio Hall - Our Commitment





## **Questions?**

## **Faculty Presentation**



## Andrew Kahng

Professor, Computer Science & Engineering



JACOBS SCHOOL OF ENGINEERING Corporate Affiliates Program The Institute for Learning-enabled Optimization at Scale (TILOS.ai)

## **TILOS AI Research Institute**

Andrew B. Kahng

#### Jacobs School Fall CAP Board Meeting October 7, 2021

The Institute for Learning-enabled Optimization at Scale

tilos.ai

TEXAS Yale



## **About Me**

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Andrew B. Kahng is Distinguished Professor of CSE and ECE and holder of the endowed chair in high-performance computing in the Jacobs School of Engineering at UC San Diego. He was visiting scientist at Cadence (1995-97) and founder/CTO at Blaze DFM (2004-06). He is coauthor of 3 books and over 500 journal and conference papers, holds 35 issued U.S. patents, and is a fellow of ACM and IEEE. He was the 2019 Ho-Am Prize laureate in Engineering. He has served as general chair of DAC, ISPD and other conferences, and from 2000-2016 served as international chair/co-chair of the International Technology Roadmap for Semiconductors (ITRS) Design and System Drivers working groups. He currently serves as PI of "OpenROAD" https://theopenroadproject.org/, a \$15M U.S. DARPA project targeting open-source, autonomous ("no human in the loop") tools for IC implementation, and as PI of "TILOS" (The Institute for Learning-enabled Optimization at Scale, https://tilos.ai/), an NSF AI Research Institute.





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**NSF** National AI Research Institute for Advances in Optimization

Mission: make impossible optimizations possible, at scale and in practice.

5-year grant, \$20M total funding from NSF (start: November 1) Partial support is from Intel Corporation (thank you!)

**UCSD** is the lead institution

**TILOS** is housed at the Halicioglu Data Science Institute



## The Institute for Learning-enabled Optimization at Scale

**Optimization: Find a best-possible solution** 

Fundamental challenges: scale and complexity

□ Nexus of AI/ML, Optimization, Use in practice

#### Vision: Four "virtuous cycles"

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- 1. Foundations: Al and Optimization
- 2. Scaling: Foundations and Use Domains
- 3. Translation: Academia and Industry leading edge
- 4. Broad Impact: Education, Outreach, and Research





## **Institute and Research Leadership**

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### **Robotics** physical systems in the real world

#### Challenged by

- Dimensionality
- Structural and Dynamic constraints
- Dynamic world with a need to anticipate changes
- Optimization target: multi-robot interaction with these challenges
  - Reduce traffic congestion by 25+%
  - Perform efficient real-world learning
  - Deploy in regular homes

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## **Communication Networks** the infrastructure of the information age

#### Challenged by

- Decentralized management/control
- Multiple design scales
  - Physical laws of signal propagation
  - Ubiquitous global connectivity

#### Impossible to sustain

- Overprovisioning wastes energy
- Optimization target:
  - Federated learning/optimization
  - Automated (blackbox) optimization
  - Integrated representation of physics



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#### • Challenged by:

• Complexity billions of transistors, stack of abstractions, nanometer physics

#### Optimization target: 1000x speedups, scalability

• Direct inference of layout

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Verification







### **From Use Cases to Foundations**







## **AI and Optimization**

Al advances pose new challenges, provide new tools for optimization

### **Five Foundation "Pillars"**

- Bridging Discrete and Continuous
- Distributed, Parallel, and Federated
- Optimization on Manifolds
- Dynamic Decisions Under Uncertainty
- Nonconvex Optimization in Deep Learning

#### New perspectives on classic problems

TILOS members have advanced all of these

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## + Much More

- NSF's NAIRI charge: become the national nexus for AI and Optimization
- People: Faculty, postdocs, Ph.D. students + additional faces
- Culture: How 30 faculty will move the needle
  - Becoming an institute, being recognized for breakthrough impact, becoming self-sustaining
- Education and Workforce Development
  - Lifelong learning, skills refresh, curricula at AI-Opt-Use nexus, precision education, ...
- Broadening Participation: Diversity and Outreach
  - Scalable "outreach in a box": Lab 3.0
  - Tiers of engagement: Exposure, Experience, Environment



## **Collaborations With Industry Translation, Impact**

#### Research: advisors, collaborators, mentors, champions

- Skin in the game: committed bandwidth, success matters
- Problem formulations, data, benchmarks and expert insight
- Supply the missing piece: AI-Opt-Use in practice

#### Workforce development

- Skills renewal
- Curriculum guidance and contributions of tutorials, guest lectures

#### Broad engagement

UCSD

- Compute resources
- Hosting of postdocs and Ph.D. students
- Challenge problems and optimization roadmap

#### • Paths to growth and sustainability

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• TILOS industry membership program, partnership models



#### TILOS The lustitute for Learning enabled Optimization at Scale

## How to Engage?

#### What's important to a company?

- Move the needle on high-stakes, real-world optimizations
- Aim talent and the latest research breakthroughs at company's problems

#### What's important to faculty, postdocs, students?

- Working on challenges that matter
- Impact at the leading edge of practice
- High-quality bandwidth, attention, data, internships, ...

#### What we all want:

- Quality bandwidth and attention, path to success (e.g., data), interns, jobs...
- Company makes the first move !

#### CSD IIII O TEXAS Yale



## **Thank You**

### The Institute for Learning-enabled Optimization at Scale

## tilos.ai

abk-tilos@eng.ucsd.edu





## **CAP** Business

Wil Dyer Director, Corporate Affiliates Program

### **CAP** Updates



Corporate Affiliates Program



## **Jacobs School Corporate Affiliates Program**



#### **CAP Talent Programs**

We help you define and execute your talent acquisition strategy with the Jacobs School

- → Tech Talks
- → Information Sessions
- → Professional Student Organizations
- → Internships & Full-time Jobs
- → Team Internship Program (TIP)
- → Cooperative Education (Co-op)
- → Ph.D Mentor Program (New!)
- → Alumni for experienced roles (New!)



Top CSE students network with CAP Partners at CSE Tutor Networking Night

#### Contact Alice Grgas at <u>agrgas@eng.ucsd.edu</u>

### **TIP & Co-op recruitment begins now!**

## Team Internship Program (TIP)

- 2-5 members; Undergraduate, Masters, and Ph.D.
- All engineering majors multi-disciplinary teams encouraged; can include non-engineering majors
- Paid Internships, 10-12 weeks over the summer
- Full-time, i.e., 40 hour/week commitment

### Cooperative Education (Co-op)

- First in the UC System
- Cohort #4: June-December 2022
- Full-time (30-40 hours per week) for up to 6 months -Summer and Fall quarters
- Undergraduate & Master's engineering students

#### Contact Alice Grgas at <u>agrgas@eng.ucsd.edu</u>

Recruiting Timeline	
October - December	Companies include TIP/Co-op in budget planning. Companies define and submit projects and recruitment starts
January - March	Companies continue to submit their projects and recruitment continues; offers extended
April	Finalize recruitment & offers
Мау	Selections completed Intern pre-deployment training
June- December	TIP period during 10-12 consecutive weeks (Jun-Sept) Co-op period up to 6 months (Jun-Dec)

### Post your open positions at the Jacobs School

UC San Diego

- Post full/part-time opportunities, internships, TIP & Co-op positions
- Proactively identify qualified students through tailored resume book
- Qualified referrals and pre-screened applicant pool
- New! Targeted outreach to alumni for open positions all year round



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Contact Alice Grgas agrgas@eng.ucsd.edu

## Learn more and access the portal at http://jacobsschool.ucsd.edu/talent

Provide mentorship for our Ph.D students, and help your company build relationships with relevant graduate students for current/future positions

Looking for more industry Ph.D mentors; Over 100 Ph.D students registered!

- → One Ph.D Student Mentee for six months, November May
- Monthly one-hour meetings arranged by mentor/mentee
- → Kick off meeting Oct 25, 12-1pm PST



Contact Alice Grgas at <u>agrgas@eng.ucsd.edu</u>

#### **Senior Design Capstone Projects**

Graduating students working at the Jacobs School with our equipment, on your projects. Submit 1-2 page project description for review by faculty member.

#### **Mechanical & Aerospace Engineering**

- → Submit project description in October
- → Projects run from Nov-Feb or Mar-Jun

#### **Electrical & Computer Engineering**

- → Submit project in Nov/Dec
- → Projects run from Jan-Mar or Mar-Jun



#### **Center for Wireless Communications**



Save the Date November 18-19, 2021 Center for Wireless Communications 5G and Beyond Forum CWC.ucsd.edu

## **Current Slate of Important Dates**

October 4/5, 2021	Computer Science & Engineering (CSE) Tutor Networking Night - Top 5% CSE students
October 19, 2021	Professional Evening with Industry (PEI) - NSBE, SHPE, SWE, WIC, and oSTEM Student Networking Night
October 20, 2021	Honors Career Fair - honors societies Tau Beta Pi and Eta Kappa Nu
October 26, 2021	Defense Night - Government & Defense Networking Night
October 27, 2021	Nano- and Chemical Engineering Day & Pitching Competition
November 19, 2021	Center for Wireless Communications (CWC.ucsd.edu) 5G & Beyond Forum
February 4, 2022	Winter CAP Executive Board Meeting

\*\*All events virtual until further notice\*\*



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## Thank you! Next CAP Executive Board Meeting: February 4, 2022