Computing & Mathematical Sciences
A guide to CMS...

Adam Wierman
CMS Dept. Executive Officer (EO) a.k.a. “Chair”
CMS @ Caltech is...

a *UNIQUE, NEW* department, formed by merging CS & Applied Math
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- **ACM**: Applied & Computational Mathematics
- **CS**: Computer Science
- **CDS**: Control & Dynamical Systems
- **CMS**: Computing & Mathematical Sciences
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**ACM option rep:** Peter Schroeder
**CS option rep:** Thomas Vidick
**CDS option rep:** Aaron Ames
**CMS option rep:** Yisong Yue
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...but you should all think of yourself as part of the **CMS department**

**CMS Grad Student Council:** Ameera Abdelaziz, Thomas Anderson, Sara Beery, Ellen Novoseller, Dimitar Ho, De Huang, Matteo Ronchi, Jialin Song
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Maria Lopez
Option Administrator for Grad Programs

Carmen Nemer-Sirois
Option Administrator for Undergrad Programs
CMS @ Caltech is... a **UNIQUE, NEW** department

{ Rigorous, Interdisciplinary, Student-centric, Small, Friendly, Impactful, Growing }
CMS @ Caltech is... a **UNIQUE, NEW** department

{ Interdisciplinary, Small, Friendly, Rigorous, Student-centric, Impactful, Growing }

20-25 faculty, so "everybody knows your name"

Meet everyone at lunch today!
CMS @ Caltech is... a **UNIQUE, NEW** department

...all Caltech faculty (not just those in CMS) can advise students in any program
...many research groups have students in multiple programs
...many students work with multiple faculty, or even have multiple advisors across multiple programs
...all programs allow you to tune courses to your research
CMS @ Caltech is...
a **UNIQUE, NEW** department

Rigorous  
Interdisciplinary  
Small  
Friendly  
Impactful  
Growing

...at both faculty and student levels

Andrew Stuart  
Fernando Brandao  
Omer Tamuz  
Lior Pachter  
Katie Bouman

Victoria Kostina  
Soon-Jo Chung  
Aaron Ames  
Anima Anandkumar

...all have joined in the last 3 years!
CMS @ Caltech is... a **UNIQUE, NEW** department

\{ **Rigorous**  
**Interdisciplinary**  
**Small**  
**Friendly**  
**Growing**  

**Impactful**  
**Impact disproportionate to our size**
CMS @ Caltech is... a **UNIQUE, NEW** department

{ Rigorous, Student-centric, Impactful, Small, Friendly, Growing, Interdisciplinary }
CMS @ Caltech is...

a **UNIQUE, NEW** department

Unapologetically mathematical, relentless focus on the foundations

- Rigorous
- Interdisciplinary
- Small
- Friendly
- Impactful
- Growing
CMS @ Caltech is...

a **UNIQUE, NEW** department

Core to our DNA
(e.g. the CMS PhD program)

Interdisciplinary

Rigorous

Small

Friendly

Impactful

Growing

Student-centric
...interdisciplinary work is not just something done by a few people, it’s everywhere

Disclaimer: this is just a small subsampling
CMS @ Caltech is... a **UNIQUE, NEW** department
Your path through CMS...
Week 1

Get settled in and meet people inside and outside of Annenberg
- Check in with Maria (office key, id, ...)
- Come to lunch today to meet folks in the department!
- Come to the TGIF at the Ath (Friday at 5:30pm)
- Take part in orientation this week

Meet with your first-year adviser
- Your first-year advisor may or may not be your research advisor
- They can help you choose courses and connect with different research groups

Register for classes
- You register with a paper add/drop card (yeah, paper...)
- Don’t worry about classes “filling up”, Caltech is small
- The first week of classes is a “shopping period”, you have a while to finalize your schedule
- Courses are hard & time-consuming, so think carefully about taking more than the required classes
Year 1
Goal: Build your foundations and get started on research
Year 1

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“core” courses & prelim exams
Year 1

Goal: Build your foundations and get started on research

“core” courses & prelim exams

→ ACM: 3-4 courses per term from the following
  Fall: ACM 101a, ACM 106a, CMS/ACM 107, CMS/ACM 113, CMS/ACM 117, Ma 108a
  Winter: A subset of ACM 101b, ACM 105, ACM 106b, Ma 108b
  Spring: Ma 108c

→ CS
  No specific core requirements

→ CMS: 2-3 courses per term from the following
  Fall (Math foundations): CMS/ACM 107, CMS/ACM 113, CMS/ACM 117
  Winter (Computing foundations): CMS/CS 144, CMS/CS 139, CMS/CS 155

→ CDS
  Fall: CDS 131, CMS/ACM 107, CMS/ACM 113
  Winter: CDS 231, CDS 232
  Spring: CDS 233
Year 1

Goal: Build your **foundations** and get started on research

“**core**” courses & prelim exams

→ ACM: 3-4 courses per term from the following

**Note**: Courses are hard and students come in with very different backgrounds. If you are worried about your background, talk to the option rep. There is flexibility!

→ CS

**Note**: You also need to register for the seminar requirement (CMS 290) every term

→ CMS: 2-3 courses per term from the following

**Note**: You have to be registered for 36 units to be “full time”

So, register for ACM300/CS280/CMS300/CDS300 for “research” units to get to 36 (or 45, if you think you might drop a course).

Fall: ACM 101a, ACM 106a, CMS/ACM 107, CMS/ACM 113
Winter: CDS 231, CDS 232
Spring: CDS 233
Year 1

Goal: Build your foundations and get started on research

“core” courses & prelim exams

Prelims are a test of your knowledge of the fundamentals. They are meant to be a “personal challenge” not a “weed out” device.
Year 1

Goal: Build your **foundations** and get started on research

**“core” courses & prelim exams**

Prelim exams are held during the middle of the 3rd term.

→ The exam in **ACM** is a 3hr written exam taken covering material in three courses from this list: ACM 101ab, ACM105, ACM106ab, ACM107, ACM113, and ACM117.

→ The exams for **CS/CMS/CDS** is a 1hr oral exam preceded by a 2hr written prep period. Students have flexibility in the topics covered:

  -- **CS**: Students choose 2 modules from Algorithms & Complexity / Networking & Distributed Systems / Machine Learning and 1 module from Linear Algebra / Optimization / Stochastics
  
  -- **CMS**: Students choose 3 modules from Stochastics / Optimization / Linear Algebra / Network Science / Machine Learning / Algorithms (including at least one from each term)
  
  -- **CDS**: Students are examined on Linear Systems and Nonlinear Dynamics along with their choice of Optimization or Linear Algebra.
Year 1

Goal: Build your **foundations** and get started on research

**“core” courses & prelim exams**

Possible outcomes:
--- Pass
--- Partial Retake (retake 1 or more modules)
--- Full Retake

The retake happens during the 1\textsuperscript{st} or 2\textsuperscript{nd} week of the summer term.

Key: Form study groups early – and quiz each other orally!

There will be “prelim prep” sessions organized by Jennifer Sun and Victor Dorobantu – look out for emails from them.
Celebrate the accomplishment when you’re done!
Year 1

Goal: Build your foundations and get started on research

Courses are the most important, but we hope you can think about research too...

- Attend talks, e.g., the CMS colloquium! This is required (CMS290)
- Find a research adviser (if you don’t have one already). The talks during the CMS colloquium can help with that.
- Get to know multiple faculty....attend more than one group meeting/seminars
- Do lots of reading!

You should settle on a research advisor (or two) by the end of the year.
Year 1

At the end of the year you will receive your first “progress letter”

Faculty meet during the summer and discuss each student’s progress individually. A letter then goes to the student providing advice & goals for the upcoming year. These shouldn’t be scary – they’re a way for us to make sure everyone gets the feedback and help they need.
Years 2-3
Goal: Pass your candidacy exam, finish your breadth/depth course requirements, and start to do independent research
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Should be taken before the end of your third year. Oral presentation with a committee of 4+ faculty where you discuss a substantial research project and a plan for your thesis. Not a thesis proposal!
Years 2-3

Goal: Pass your candidacy exam, finish your breadth/depth course requirements, and start to do independent research

**ACM**: Total of 18 grad level courses

**CS**: 6 adv. CS classes and 3 classes outside of CS

**CMS**: 3 adv. classes in a “focus area”, and 3 adv. classes from any area in Eng/Math/Econ

**CDS**: 3 adv. CDS/ACM classes, 3 adv. classes in a “focus area” outside of CDS
Years 2-3

Goal: Pass your candidacy exam, finish your breadth/depth course requirements, and **start to do independent research**

...TAing can be valuable during this time – talk to your adviser.
...yearly “progress letters” are very valuable during this time.
Years 4-6
Goal: Publish (lots...), graduate, and get a job!
Other important things

Attend lots of seminars: Lunch Bunch, CMI, SISL, RSRG, CMS, CDS, EE, IQIM, TCS+, ...

Attend social events: CMS Bashes, CDS Tea, Theory Tea, TGIF, ...

Get on lots of mailing lists: Look at the option guidelines for some of them... The key one is “thisweek@cms”.

Computing equipment: Ask your adviser. All students have a budget of $2000 that can be spent as desired during their career.

Switching between options is possible: Key difference is the course requirements...all faculty can advise students in all options. Choose based on what will prepare you best for your research goals!
Other important things

Get to know everyone, not just people in your options: You’re all mixed up in the bullpens, you’ll be taking many of the same classes, even your prelims overlap considerably – take advantage of this!

(Grad) Women in CMS: A new group this fall to help women in our department connect with each other. Kick-off dinner TBA: Talk to Sara →

Don’t confine yourself to Annenberg & Steele: There is a lot going on all across campus. Get to know folks at orientation and then pay attention to the GSC events.

There are a lots of resources across campus: Teaching & Outreach (CTLO), Writing help (Hixton Center), Diversity Center, International Office, Entrepreneurship (OTTCP and Entrepreneur in residence), Counseling Center, ...
Welcome!