Computational Precision Health

Computational Precision Health (CPH) is an exploding field across both academia and industry. This rapidly evolving field integrates the tremendous advances in data science and data availability that have occurred over the past decades with expertise in clinical medicine, public health, and health care systems to enable a paradigm shift in the ways we treat and prevent disease. Advances in data and analytics open the door to faster deployment of more effective health interventions, but this potential can only be achieved if the underlying computational and analytic tools are conceived, tested, and validated for the health and health care needs of diverse individuals and communities. The field of Computational Precision Health aims to realize this potential.

PhD

The PhD in Computational Precision Health leverages and bridges the complementary expertise and incredible resources of UC Berkeley and UCSF to create an unparalleled and truly unique learning environment. Students in the PhD in Computational Precision Health will develop skills and expertise in both the computational sciences (machine learning and AI, natural language processing, statistical inference and modeling, data standards, parallel computing and data at scale, etc.) and health sciences (clinical decision sciences and cognitive informatics, clinical delivery, clinical research, implementation science, health information policy, etc.)

Students will develop the ability to work in interdisciplinary teams from ideation to development, testing, and validation in the real world. Coursework will be complemented by extensive and early interaction with world-class faculty—through research rotations, seminar series, and practicums—at the intersection of computation and health, and will develop proficiency in cross-disciplinary research and communication. A focus on diversity, equity and inclusion, human-centered design accommodating diverse users, and the ethical implications and societal impacts of the work will be embedded throughout the program.

Fall 2025 PhD Applications are open on: TBC

More details on curriculum and CPH courses can be found on our website: computationalhealth.berkeley.edu (https://computationalhealth.berkeley.edu/).

Designated Emphasis

The Designated Emphasis in CPH is administered by the joint UC Berkeley/UCSF Computational Precision Health Augmented Graduate Group. The UCB CPH DE allows PhD students from affiliated UCB programs to incorporate CPH courses and advising into their PhD. CPH DE students will receive a solid grounding in the fundamentals of computational precision health, with training in the application of computation to the practice of medicine and public health. Students will be part of an interdisciplinary, intercampus community of UC Berkeley and UCSF scholars with diverse academic backgrounds, providing unique cross-campus opportunities, including direct exposure to the clinical care and health science environment offered at UCSF.

PhD Admissions

The PhD program in Computational Precision Health welcomes students from a broad range of computational sciences, health sciences, and interdisciplinary backgrounds.

Admission for the PhD in Computational Precision Health is for the Fall semester only. 2024-2025 Graduate Admissions Application opens in September 2024. The Deadline for Applications December 3, 2024 (no rolling admissions). Please select Admit Term Fall 2025.

Applications are submitted via the UC Berkeley Graduate Division application portal. More information about requirements (https://computationalhealth.berkeley.edu/admissions/).

Designated Emphasis (DE) Admissions

A designated emphasis (DE) is an interdisciplinary specialization, such as a new method of inquiry or an important field of application, which is relevant to two or more existing doctoral degree programs. A DE is not a standalone program, but is offered to complement a student's current doctoral studies. UC Berkeley PhD students are welcomed to apply as well as students from UCSF affiliate programs. More information. (https://computationalhealth.berkeley.edu/designated-emphasis/)

Students are encouraged apply at least two semesters before your Qualifying Examination by submitting the following materials to the Computational Precision Health Program, by emailing the documents below to cph.info@berkeley.edu.

- Petition for Admission to the Designated Emphasis in Computational Precision Health (https://docs.google.com/forms/d/1SCQm5lYQz0uGmVlGm5shgkBuX9u2_qkGXI9Prn8Q1YM/edit/).
- Letter of intent summarizing your research interests and background in Computational Precision Health. When possible, the letter should include one or more CPH Core Graduate Group faculty members from your home campus as potential DE advisors
- Letter of recommendation from a CPH Graduate Group Core (https://computationalhealth.berkeley.edu/faculty/) or Affiliate faculty member, ideally from your home campus.
- An updated CV and academic transcript

Courses may be taken at UCSF (https://computationalhealth.ucsf.edu) or UC Berkeley (https://computationalhealth.berkeley.edu/curriculum/):

CPH 215: Lab Rotations *(at least 4 units x 2 semesters in the first year)*

Students will take two 10-week research group rotations in their first year. One rotation will be on each campus, with one rotation in a predominantly computational science "lab" (with a health emphasis) and one in a health science "lab" (with a computational emphasis).

CPH 270: Computational Precision Health Seminar *(2 semester units x 6 terms)*

Students will enroll in six terms of the doctoral seminar, including the first two terms after matriculation. Seminar will consist of journal club-style discussion of recent literature in computational precision health, talks by guest faculty, and presentations by second and third year students on work in progress. Seminar will consist of journal club-style discussion of recent literature in computational precision health, talks by guest faculty, and presentations by second and third year students on work in progress.

UCSF courses

Three-Part Cornerstone Series, taken at UCSF *(3 units x 3 quarters)*

CPH 200A, CPH 200B AND CPH 200C: COMPUTATIONAL PRECISION HEALTH CORNERSTONE COURSE SERIES *(3 UNITS PER COURSE, 3 UNITS PER QUARTER FIRST YEAR)*
This course series, which uses Problem-Based Learning to build student's ability to work effectively in interdisciplinary teams, from ideation to development, testing, and validation in the real world.

CPH 201A: CPH PRACTICUM*(3 UNITS):* Provides the foundations for understanding and engaging with inpatient and outpatient clinical care. Students will gain deep and continuing exposure to the clinical and public health contexts in which CPH advances are to be deployed. Students will have in-depth real world exposure relevant to problem area(s) covered in the problem-based learning core, including clinical, research, and operational work in inpatient, outpatient, community health, and/or public health settings, AND

CPH 201B: CPH PRACTICUM *(3 UNITS):* A 2-semester course series taken during the second year of Computational Precision Health, augmenting the Cornerstone course to provide deep and continuing exposure to the clinical and public health contexts in which CPH advances are to be deployed. Students will have in-depth real world exposure relevant to problem area(s) covered in the problem-based learning core, including clinical, research, and operational work in inpatient, outpatient, community health, and/or public health settings.

GRAD 202: Race and Racism in Science (2 quarter units=1.3 semester units): Discusses the historical background of systemic racism in scientific research, AND

GRAD 214: Ethics and the Responsible Conduct of Research, L. Silva (1.5 quarter units=1 semester unit): Addresses key issues affecting the responsible conduct of scientific research.

Curriculum/Coursework

Students admitted to the CPH DE program must complete two semesters of the CPH Doctoral Seminar, and at least 3 courses from the core course list below, in the following two domain areas:

1. Health and Public Health Sciences
2. Computing and Statistical Sciences

In order to ensure that the DE confers sufficient additional breadth beyond a student's home program, students in a primarily computational PhD program (for example, Bioengineering, Electrical Engineering and Computer Science, Computer Science, Statistics, Biostatistics, Computational Biology, Industrial Engineering and Operations Research) will be required to take at least two courses in the health domain; those in Epidemiology and Health Policy will be required to take at least two courses in the Computational Sciences domain.

Core Courses

Qualifying courses are listed below. Additional courses falling within the two domains below may also qualify, to be approved by the student's DE advisor.

1. Health and Public Health Science

Clinical Reasoning and Personalized Medicine: diagnosis and treatment, evidence-based medicine

PB HLTH W250B	Course Not Available	4
PB HLTH W226C	Course Not Available	3
PB HLTH 255D	Methods in Social Epidemiology	2
PB HLTH 222A	Biomedical Innovation Policy	3
PB HLTH 235	Course Not Available	3

2. Computing and Statistical Sciences

COMPSCI 289A	Introduction to Machine Learning	4
COMPSCI 286A	Course Not Available	4
COMPSCI C281A/ STAT C241A	Statistical Learning Theory	3
STAT 156	Causal Inference	4
STAT 154	Modern Statistical Prediction and Machine Learning	4

In some cases, for example, STAT 154 and STAT 156/STAT 256, an upper division undergraduate course may be acceptable for the DE. This is due to the desire to accommodate students from non-computational PhD programs who may not have the programming, mathematics or statistics prerequisites for corresponding graduate-level coursework.

CPH Doctoral Seminar

In addition, students will participate in at least 2 semesters of the CPH Doctoral Seminar. The seminar will consist of a combination of journal club-style discussion of recent literature in Computational Precision Health, and guest faculty speakers drawn from across the CPH Graduate Group and beyond. This seminar will be held in conjunction with UCSF DE CPH students.

Elective Courses

No Elective courses are required for the Designed Emphasis, but the DE Advisor may guide students on additional courses to supplement their training in this field.

UC Berkeley Affiliated Programs

PhD in Bioengineering

PhD in Electrical Engineering and Computer Sciences

PhD in Computer Science

PhD in Biostatistics

PhD in Statistics

PhD in Computational Biology

PhD in Epidemiology

PhD in Health Policy

PhD in Industrial Engineering and Operations Research

PhD in Information Science

*Students from any PhD program at UC Berkeley are welcome to apply.

Normative Time

No additional time can be added to the normative time of your home department.