

# Requirements for the Joint PhD Program in Machine Learning & Public Policy (updated June 2014)

## Coursework requirements

The coursework requirements for the joint program consist of thirteen courses: five core courses from the Machine Learning Department, five core courses from the Heinz College, and three advanced elective courses (Heinz, ML/Stats, and MLP).

The five MLD core courses are identical to those required for the MLD Ph.D. program: Advanced Introduction to Machine Learning (10-715), Statistical Machine Learning (10-702), Intermediate Statistics (10-705), and two of the following: Convex Optimization (10-725), Graphical Models (10-708), Multimedia Databases and Data Mining (15-826), and either Algorithms (15-750) or Algorithms in the Real World (15-853).

The five Heinz core courses consist of three semesters of the Heinz Ph.D. Seminar (90-901, 90-902, and 90-918\*), Microeconomics (90-908), and a course in another social science (e.g., Organizational Behavior, Social Psychology, or Political Science. See Heinz Ph.D. Handbook for acceptable courses)\*\*

Finally, students will take three Advanced Elective courses. One of these courses will come from Heinz College, one from either the Machine Learning Department or the Statistics Department, and one from the course offerings in Machine Learning and Policy (e.g., 10-830 and 10-831).

Students are expected to complete their coursework requirements by the end of their third year, with most students completing these requirements by the end of their second year.

A typical schedule of coursework for this program would be as follows (although the exact schedule will depend on course offerings, which vary from year to year):

Fall 1: Advanced Introduction to Machine Learning (10-715), Intermediate Statistics (10-705), Microeconomics (90-908), Heinz Ph.D. Seminar I (90-901).

Spring 1: Statistical Machine Learning (10-702), ML Core Course, Social Science, Heinz Ph.D. Seminar II (90-902).

Fall 2: Heinz Advanced Elective, ML/Stats Advanced Elective, Heinz Ph.D. Seminar III\* (90-918).

Spring 2: ML Core Course, MLP Advanced Elective.

## Notes

\* Heinz Ph.D. Seminar III consists only of a single presentation, to be given to the first year Heinz Ph.D. students. There are no regular class meetings for this course.

\*\* Heinz Ph.D. students have a “Quantitative Methods” requirement, as well as an additional Advanced Elective requirement, which can be taken outside Heinz College. The core ML courses and MLP Advanced Elective fulfill these requirements; no additional courses are necessary. Also, MLD Ph.D. students have a two-course “depth requirement” and a Statistics elective. The three Advanced Elective courses (ML, Heinz, and MLP) fulfill these requirements; no additional courses are necessary. Finally, joint program students are not required to attend the MLD Journal Club (10-915).

## Research requirements

Students in their first year are expected to spend the majority of their time on coursework, to select research advisors from MLD and Heinz, and to begin working on directed research under their advisors’ supervision. It is expected that Ph.D. students actively engage in research from their first semester; however, the additional coursework requirements of the joint program are likely to lead to a slower initial pace of research. In their second and succeeding years, students are expected to spend at least half their time on research, and are expected to make continued satisfactory research progress as evaluated by the regular student review meetings in both MLD and Heinz.

Additionally, students are expected to attain certain specific research milestones as specified for the Heinz and MLD doctoral programs:

- The successful presentation of the First and Second Heinz Research Papers, by the end of the student’s second and third years respectively. Both of these papers will be jointly advised by faculty members from Heinz and MLD. One of the two papers must fulfill the requirements of the MLD Data Analysis Project and be approved by the MLD faculty; this DAP presentation may be combined with the Heinz paper presentation.
- The student’s thesis proposal, typically during the fourth year, and thesis defense, typically during the fifth year. As for similar joint programs, the student’s thesis topic should deal with material of interest and relevance to both faculties, i.e., it should both demonstrate methodological advances in machine learning and present advances in clear and well-defined policy applications. The thesis will be jointly advised by faculty members from both departments, and there will only be a single dissertation proposal and defense, which must meet the requirements for approval by both Heinz and MLD.

## **Other requirements**

Students in the joint program must also meet requirements for programming proficiency, teaching, and speaking skills, as discussed in the MLD Ph.D. student handbook. The programming proficiency requirement will typically be attained in the course of the student's research and confirmed by their advisors, while the speaking skills requirement may be achieved through the presentation of the student's First and Second Heinz Papers or through a separate presentation. Finally, each student must serve as a teaching assistant for two semester-length courses, one course in MLD and one in Heinz.