# MCS 548 – Mathematical Theory of Artificial Intelligence

## Syllabus

Lev Reyzin

Fall 2020

**Time and location:** M-W-F, 1:00-1:50pm. *Online.*

**Instructor:** Lev Reyzin, `lreyzin@uic.edu` (SEO 418, 312-413-3745)

**Prerequisite background:** Familiarity with the design and analysis of algorithms, basic computational complexity theory, and mathematical maturity.

**Office hours:** TBD

**Website:** `http://homepages.math.uic.edu/~lreyzin/f20_mcs548/`

**Required textbook:** Mehryar Mohri, Afshin Rostamizadeh, and Ameet Talwalkar. *Foundations of Machine Learning, second edition*

**Optional textbook:** Shai Shalev-Shwartz and Shai Ben-David. *Understanding Machine Learning: From Theory to Algorithms*

**Topics:** This course will focus on the mathematical foundations of computational learning theory. Example topics include: PAC learning, agnostic learning, online learning, bandit problems, statistical queries, learning with experts, inductive inference, query learning, boosting, support vector machines, and neural networks. This course is represented in the mathematical computer science prelim.

**Grading:** Course grades will be determined according to the following breakdown.

- 50% take-home problem sets
- 30% research project – each student will be required to complete a small research project
- 20% in-class presentation – each student will present a research paper on a topic related to his or her research project and be expected to answer questions about it

Grades may also be adjusted upward or downward depending on class participation.

**Problem set collaboration policy:** Unless otherwise specified on an assignment, students may discuss problem sets with one another, but they *must write the solutions on their own.* Collaborators (people you speak to about an assignment) must be named at the top of the assignment.

**Late work policy:** In general, late work will not be accepted. Problem sets are to be turned in via Gradescope by 1:00 pm the day they are due). Any exceptions will be handled on a case-by-case basis.

**Disability policy:** Students with disabilities who require accommodations for access and participation in this course must be registered with the Office of Disability Services (ODS). Please contact ODS a 312/413/-2183 (voice) or 312/413-0123 (TTY).