

Algorithms and Probability in Board Games with a Focus of Bridge

Course Description:

The purpose of this course is to give students an application of algorithms and probability using games such as bridge, chess, and Go. First there will be an introduction to the card game of bridge for those that have never played before. This includes a history of the game and the basics of how to play. Second, there will be an introduction to probability for those that may not have taken a class in statistics or could use a refresher. Then, the course will go in depth on how bridge is an application of probability and how it can be used to improve quickly. Within this context, we will think about how to implement these solutions programmatically. Finally the connection between bridge, chess, and Go AI's will be explored in the last third of the course.

Course Details

Prerequisites: None

Credits: 1

Seats: 20

Lecture Time: 3-4:15pm Monday

Location: ESJB0302

Semester: Spring 2019

Textbook: Notes will be provided by the facilitator

Course Facilitator: Hakan Berk

Faculty Advisor: Dr. Larry Washington

Contact Information

Course Facilitator: Hakan Berk – hberk@umd.edu

Faculty Advisor: Dr. Larry Washington - lcw@math.umd.edu

Course Objectives

By the end of the course, students will be able to

- Understand the history of bridge
- Learn the basics of playing bridge
- Review and understand basic probability, including combinations and permutations
- Learn how to apply probability to bridge in order to make educated plays for both declarer and defense, while thinking about how an AI would approach the same situations
- See how probability can help with more advanced bridge plays
- Understand the history of bridge and programming, how current algorithms work, and explore options for better AI's

- Compare the current bridge AI's to AI's of other games such as Chess and Go. This includes a comparison of the strength of the AI as well as the algorithms used

Schedule:

Week	Date	Topic	Assignment
1	1/28	What is the card game bridge?	Assigned: Initial Survey
2	2/4	Introduction to Bidding and Declarer	Due: Initial Survey Assigned: Bidding / Declarer homework
3	2/11	Introductory Probability Review	Due: Bidding homework Assigned: Probability homework
4	2/18	Bridge Scoring, Bidding, and Probability	Due: Probability homework Assigned: Bridge Scoring
		Introduction to Probability and Declarer Play	
5	2/25	Bridge Bidding Practice	Due: Scoring homework Assigned: Bridge Bidding Practice
6	3/4	How to finesse	Due: Bridge Bidding Practice Assigned: How to finesse homework
7	3/11	Midterm	Due: How to finesse Due: Nothing, Happy Spring Break!
8	3/25	Suit Combinations	Assigned: Suit Combinations
9	4/1	Combining your chances	Due: Suit Combinations Assigned: Combining Chances homework
11	4/8	Find the Missing Cards	Due: Combining Chances Assigned: Find the Missing Cards
		Programming and Bridge	
12	4/15	History of programming and bridge	Due: Find the Missing Cards Assigned: History Reflection
13	4/22	Guest Lecture by Clyde Kruskal	Due: History Reflection Assigned: Guest Lecture Reflection
14	4/29	Machine Learning and Bridge	Due: Bridge AI Analysis Assigned: Final Paper
15	5/6	N/A	Due: Final Paper

The syllabus can be subject to change based on the current progression of the course topics and any other factors.

Grading:

Percentage	Title	Description
20%	Class Participation	Participation grade will be based on attendance and how much/well one contributes to playing bridge and learning the concepts
20%	Final Paper	The final paper is a reflection of the course, what a student feels they learned, favorite and least favorite parts of the class, and more.
30%	Weekly Homework Assignments	Weekly homework assignments will be graded for both completion and accuracy.
30%	Midterm Exam	The Midterm Exam will cover the first half of the course and test on basic probability and some applications with respect to bridge.

The weekly homework assignments will be available at the start of each class and will be due before the start of the following class. Items can be turned in late for a 10% penalty for the first week and then 10% penalty the following week. After two weeks, you will not be able to submit the assignment on ELMS. Each quiz also has two attempts, so please feel free to re-submit if you did not do well on the first try.

If you will not be in town on the date of the midterm or have an excused absence, please let me know in advance so accommodations can be made.

About the Facilitator

Hakan Berk is a senior electrical engineering student with a passion for bridge. He has played the game for 10 years and has represented the United States in the U21 world championships on three occasions. He also founded and currently runs the

University of Maryland Bridge Club. The course combines a passion for both cards and numbers in the hope to create a fun way to apply probability.

Disability Support Accommodations

See the section titled "Accessibility" available at Course Related Policies via <http://www.ugst.umd.edu/courserelatedpolicies.html>

Academic Integrity

Cases of academic dishonesty will be pursued to the fullest extent possible as stipulated by the Office of Student Conduct. Note that academic dishonesty includes cheating, fabrication, and plagiarism, but also includes helping other students commit acts of academic dishonesty by allowing them to obtain copies of your work. It is very important for you to be aware of the consequences of cheating, fabrication, facilitation, and plagiarism. Learn more about the Code of Academic Integrity and the Student Honor Council via <http://www.shc.umd.edu>

Excused Absence and Academic Accommodations

See the section titled "Attendance, Absences, or Missed Assignments" available at [Course Related Policies](#).

Course Evaluations

As this course is brand new, we welcome any suggestions to improve the course both throughout the semester and after it is done. Throughout the semester feel free to contact the course instructor or the faculty advisor at any point to discuss possible suggestions or changes. At the end of the course, please go to <https://courseevalum.umd.edu/> to fill out the course evaluation, as the feedback is essential for the improvement of the course.