

STEM Solutions for Problems in the Humanities

Patrick Juola

Note: Class is taught in English

Welcome to STEM Solutions for Projects in the Humanities! I'll try to keep the syllabus short and sweet — and relevant — to keep the number of trees killed to a minimum. *Hang on to this syllabus!* There is important information about when topics are going to be covered, and what you are supposed to be reading/doing. I also attach some stuff about what I am hoping for in terms of class conduct and course rules. Since I'm used to teaching in the American system, my teaching style may be unfamiliar to you—but I hope it will be effective

I don't think there is a formal catalog description for this course, but I plan to cover

mathematical and algorithmic formalisms for representing and solving problems in the humanities, including formal logic, combinatorics, algebraic structures, and probability and statistics.

Most of the computer programming examples will be done in Python, but the material will extend to any typical programming language such as Java, C/C++, Ruby, and so forth. Most of the examples will be drawn from natural language processing, because that's my particular specialty, but students are encouraged to bring-your-own-data for discussion and workshopping. Finally, I hope to cover at least some uses of generative artificial intelligence (GenAI) and its applications.

Course Goals and Outcomes

At the end of this class, the participant should have mastered the following:

- How to design and analyze algorithms to solve problems
- A broad base of mathematics sufficient to formalize humanities problems and describe them to technical specialists
- The ability to quickly learn and adapt to new and updated tools in the professional environment
- Application of the above to examples in the real world.

Course/Topic Agenda

Week	Topic(s)	Notes
12 Feb	Logic and Analysis	
19 Feb	Group discussion: Python Programming	
26 Feb	Discrete Mathematics and Representation	
5 Mar	Group discussion: Quantitative Linguistics	
12 Mar	Algebra and Structure	
19 Mar	Group Discussion: Conjecture Generation	
26 Mar	Probability and Statistics	
2 Apr	Group Discussion: Large Language Models	
9 Apr	Change and Rates of Change	
16 Apr	Spring Break (work t.b.d.)	
23 Apr	Group Discussion : Culturomics	
30 Apr	Reliability and Replicability	
6 May	Group Discussion: <i>topic t.b.d.</i>	
13 May	Design and Project Management	
TBA	Virtual Poster Presentations	

Rules of the course

Basic Americanisms Like many Americans, I am very informal. I encourage you to call me "Patrick," instead of "Doctor" or "Professor." I encourage people to ask questions—if you don't understand something, it's because I didn't explain it well, not because you are lazy or stupid. I encourage you to answer *each other's* questions because we all have our own areas of expertise, and God knows that I have my own areas of ignorance. Finally, out of class communications are encouraged—if you have a question *now*, you learn best by getting the answer *now*.

Grading I have no idea how Hungarian university courses are graded. But as far as I'm concerned, the best measure of your learning is the quality of your future work. All students will be expected to do a project and a virtual poster presentation at the end of the semester. If you do good work on the project, you have learned a lot and deserve a good grade.

Homework Homework will normally be assigned on Wednesday, discussed the following week, and a report due on the following Wednesday. Homework is typically due at the *beginning* of class. Late assignments will not, in general, be accepted. Yes, I'm serious about this. Start your assignments early and come for help if you need it.

Class conduct Attendance in class is not mandatory. Of course, strictly speaking, passing the class isn't mandatory either. Attendance *is* strongly encouraged. Students are still responsible for homework assigned or due on missed classes. Furthermore, I hope to be providing interesting, useful, and relevant information in lecture that won't be available just by reading the text. I will also be answering questions and providing explanations for the benefit of the bewildered. For this reason, I hope you all see fit to attend. And on this note. . .

Questions are good. Questions are the easiest way for me to figure out if everyone understands. Questions are also one of the best ways for you to have your difficulties cleared up. I hope you feel comfortable asking questions as confusion occurs. For this reason, I hope (and expect) that everyone will participate in classroom discussion, but it will not be a part of the grade.

Academic Integrity Group work is acceptable and expected among professionals, but don't *cheat*. If you rely on other people's learning, you are depriving yourself of valuable experience in the future.

Generative AI: Generative AI can be a very powerful technology, but can also get you in a lot of trouble. For the foreseeable future, GenAI systems like ChatGPT can generate coherent, stereotyped text, but have no "understanding" of what they are writing—if I ask them a yes/no questions, they will give me a well-written answer that may or may not be the exact opposite of the truth. For this reason, students should be very careful in using AI in this class, and should make sure that everything they submit actually represents their own work.

On the other hand, learning how to use AI tools skillfully and responsibly is an important part of your education. Unless otherwise stated, students will be allowed to use AI tools and services, but this use must be appropriately cited. If you utilize AI for one of the allowed assignments and/or activities, you must specify:

- What specific content was generated by AI
- What AI tool was used
- What prompt was used to generate the AI content
 - Both the prompt and original response from the AI tool must be provided (as a screenshot or PDF) in order for your use to be considered "cited" properly.

– Why the content was generated with AI

Please remember that you are in this class to achieve specific learning outcomes; using AI can bypass the learning process and deprive you of the outcomes. In addition to devaluing your own degree, it can also devalue the degrees of everyone else. It can also result in more immediate problems, as I'm pretty good at identifying AI-written work (text analysis is my research specialization). If you do decide that your education isn't important, why are you here?

Getting in touch Office hours are there for your benefit; please use them. There are few things as frustrating, from my end, as sitting for hours on end in an empty office, getting no questions, and then grading a bunch of dismal homeworks showing that no one understood a word of the lecture. I also have a telephone in my office and check Email frequently. And if things start to go dreadfully wrong, please tell me. Despite the draconic tone of this syllabus, I do try to be reasonable in cases of dire emergency *if* you can tell me while things are still fixable.

Your expectations So that's what I expect from the class. What can you expect? Well, organized and useful class conduct, at a minimum. Accurate, responsive, and helpful feedback on things going badly or going well. Other than that, part of what I hope is that you will help me in telling me what you expect to help *you* get the most out of this course, this department, and this university.

Contact Information

(Dr.) Patrick Juola
Contact information *to be determined*.