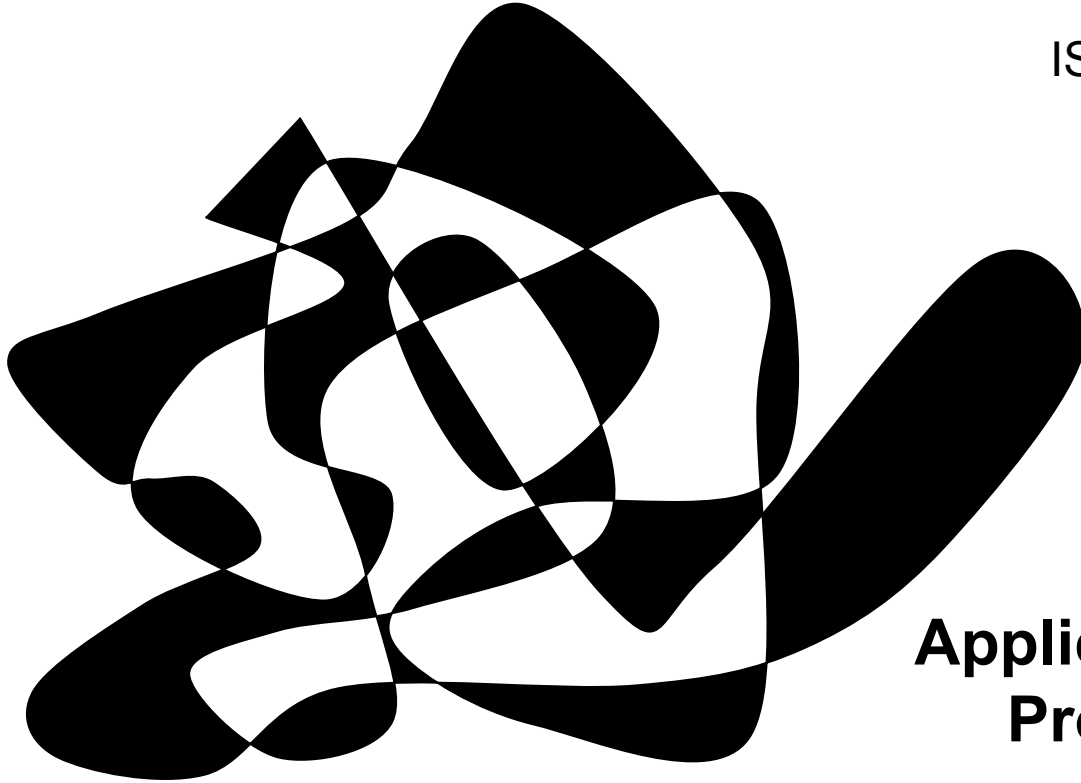# Advanced Project Management

IS 594, Section PJ

Applications II (Algorithmic Project Management)

Algorithms for Project Management

Algorithm: a process or set of rules to be followed in calculations or other problem-solving operations, especially by a computer.

01	02	03	04	05
Needs Assessment	Planning	Analysis	Traceability And Monitoring	Evaluation

How do you select an algorithm?

Start with a question. What problem do you need to solve?

- schedule team activities, find dependencies, optimize costs and benefits, do repetitive tasks.

Think about what copmputable steps need to be taken to solve problem.

Defining the problem clearly.

- ask good questions, get good answers! Then seek more refined answers.

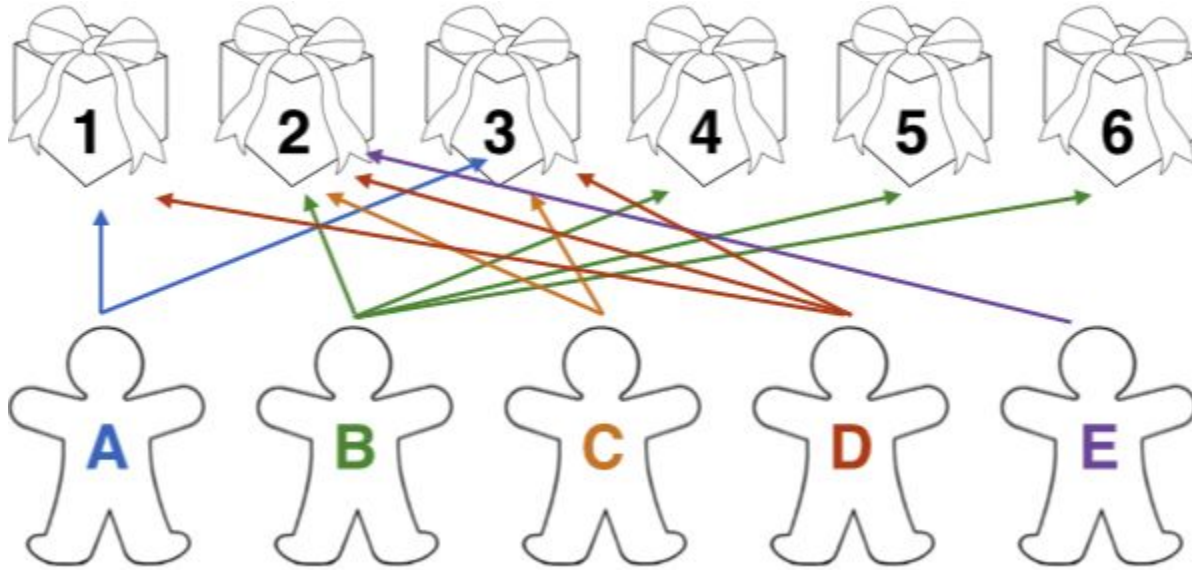**Breaking the problem down into small, simple parts.**

- each subquestion – correspond to an instruction (1-3 lines of code).

Define and implement the solution for each part of the problem.

- break algorithm structure down into functional goals, then combine.

Efficiency: reduce runtime, improve commenting.

Matching Algorithms

Bipartite matching (resources to people – Ford-Fulkerson algorithm on a flow network), person matching (people to people), assignment problem (both combinatorial optimization).

Uses of the Ford-Fulkerson Algorithm in Project Management

1) Resource Allocation.

- improves decision-making for project managers by offering a clear picture of resource flows.
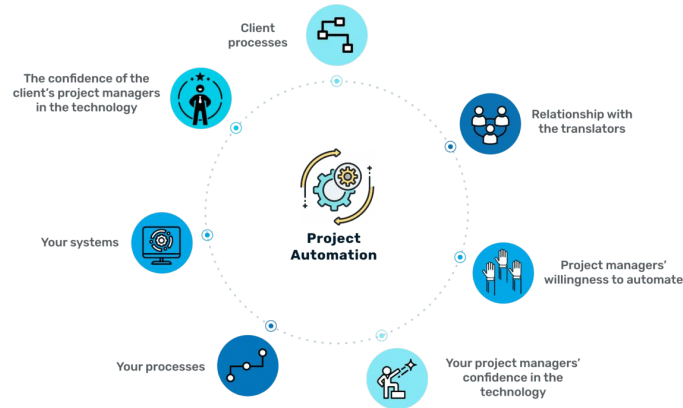
- optimization of resource utilization.

2) Task Scheduling.

- identifies bottlenecks and provides actionable insights to resolve them.

3) Supply chain optimization.

4) Visualize complex dependencies.

Client processes

The confidence of the client's project managers in the technology

Relationship with the translators

Project Automation

Your systems

Project managers' willingness to automate

Your processes

Your project managers' confidence in the technology

Project management automation is the computerization of individual project management processes with specialized software.

Teams use it to schedule manual, repetitive tasks automatically based on predetermined triggers.

Can result in an increase in productivity, and encompasses a series of ongoing and repeated project procedures based on a business strategy.

CoPilot: Automated Project Management?

Automate various tasks in a workflow (meetings, documentation, admin, coding, reports).

CoPilot: Automated Project Management?

E-mail management

Content understanding
and optimization

Automate repetitive tasks

Intelligent code completion

Editing Assistance

Meeting insights

Data analysis
(function generation and visualization)

Schedueling

Intelligent Code Completion

Intelligent code completion has its origins in spellcheckers.

- SPELL (1971): first program for general English spellchecking.

- plausible spelling via adjacent letter transpositions.

- Autofill: previously-entered or predetermined values for text entries.

- variation on language and learning models (Seq2Seq, out-of-vocabulary models, neural LMs, RNNs).

Intelligent Code Completion

https://en.wikipedia.org/wiki/Intelligent_code_completion

Privacy concerns [edit]

The Copilot service is cloud-based and requires continuous communication with the GitHub Copilot servers.[26] This opaque architecture has fueled concerns over telemetry and data mining of individual keystrokes.[27][28]

Security concerns [edit]

A paper accepted for publication in the IEEE Symposium on Security and Privacy in 2022 assessed the security of code generated by Copilot for the MITRE's top 25 code weakness enumerations (e.g., cross-site scripting, path traversal) across 89 different scenarios and 1,689 programs.[18] This was done along the axes of diversity of weaknesses (its ability to respond to scenarios that may lead to various code weaknesses), diversity of prompts (its ability to respond to the same code weakness with subtle variation), and diversity of domains (its ability to generate register transfer level hardware specifications in Verilog).[18] The study found that across these axes in multiple languages, 39.33% of top suggestions and 40.73% of total suggestions led to code vulnerabilities. Additionally, they found that small, non-semantic (i.e., comments) changes made to code could impact code safety.[18]

Education concerns [edit]

A February 2022 paper released by the Association for Computing Machinery evaluates the impact Codex, the technology used by Github Copilot, may have on the education of novice programmers.[11] The study utilizes assessment questions from an introductory programming class at The University of Auckland and compares Codex's responses with student performance.[11] Researchers found that Codex, on average, performed better than most students; however, its performance decreased on questions that limited what features could be used in the solution (e.g., conditionals, collections, and loops).[11] Given this type of problem, "only two of [Codex's] 10 solutions produced the correct output, but both [...] violated [the] constraint." The paper concludes that Codex may be useful in providing a variety of solutions to learners, but may also lead to over-reliance and plagiarism.[11]

Algorithmic Project Management

Digital direction of labor:

- delegation of managerial functions to algorithmic and automated systems.

- "large-scale collection of data" → "improve learning algorithms that carry out learning and control functions traditionally performed by managers".

- accounting devices (rankings, lists, classifications, stars and other symbols) → effectively manage their operations and create value without the need for traditional forms of hierarchical control.

Kornberger et.al (2017). Evaluative infrastructures: Accounting for platform organization. *Accounting, Organizations and Society*, 60, 79–95.

- Critical view of evaluative infrastructure: plethora of interacting devices, including rankings, ratings, reviews, and audits to establish orders of worth.

Möhlmann et.al (2021). Algorithmic Management of Work on Online Labor Platforms: When Matching Meets Control. *MIS Quarterly*, 45 (4), 1999–2022.

- Online Labor Platforms (OLPs): match workers to work, how workers behave (respond to market forces and organize).

Algorithmic Control in Platform Food Delivery Work

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https://journals.sagepub.com/doi/10.1177/2378023119870041

Algorithmic Despotism:

- Instacart's approach to assigning and evaluating work: flexibility should be viewed from the perspective of both workers and managers.

Algorithmic Labor and Information Asymmetries:
A Case Study of Uber's Drivers

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https://ijoc.org/index.php/ijoc/article/view/4892/1739

Algorithmic Despotism:

- due to information asymmetries, workers need self-efficacy with design principles of technology.