Software
Engineering

Partha Pratim
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Smart
Software
Engineering

AI in Software
Engineering

Software Engineering
in AI

AI Engineering

CS20006: Software Engineering
Module 08: Smart Software Engineering

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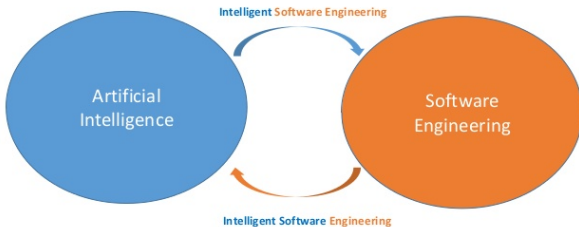Software
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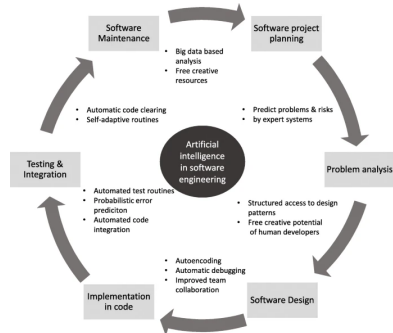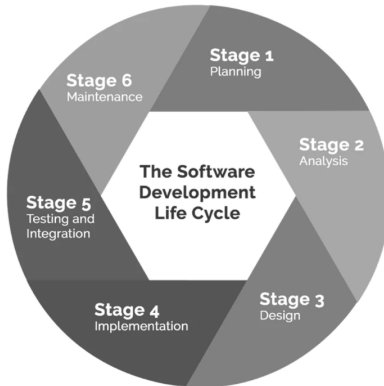
Artificial Intelligence ⬅➡ Software Engineering

- Artificial Intelligence Engineering, *SEI, Carnegie Mellon University*

Smart Software Engineering: AI in Software Engineering

- **Applications of AI in classical software engineering**, Jul-2020
  - AI in software project planning
  - AI at the stage of problem analysis
  - AI at the stage of software design
  - AI at the stage of software implementation
  - AI at the stage of software testing and integration
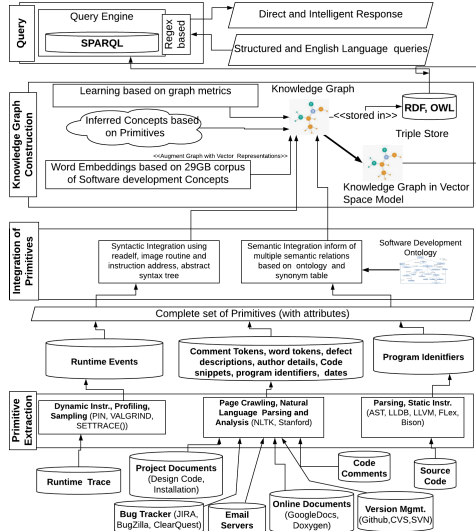 - AI in software maintenance

Smart Software Engineering: AI in Software Engineering

Software Engineering

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SMARTKT 2.0: A Search Framework to assist Program Comprehension using Smart Knowledge Transfer

- Knowledge Transfer (KT) is a serious challenge
  - Documentation often is dated
  - Design is broken
  - Code comments inadequate
  - Original project team / experts unavailable
  - ...
  - Learning about the project (Program Comprehension) is tough
- SmartKT tries to extract knowldge of the project from
  - Runtime Trace (Dynamic Analysis)
  - Source Code (Static Analysis)
  - Code Comments (Linguistic Analysis)
  - Bug Tracker
  - Version Control
  - Emails
  - ...
- Tool by Srijoni Majumdar and Partha Pratim Das

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- **5 ways artificial intelligence is upgrading software engineering**, Sep-2018: AI and software intelligence tools aim to make software development easier and more reliable. According to a Forrester Research report on AI's impact on software development, automated testing and bug detection tools use AI the most to improve software development
  - Software design
    - Artificial Intelligence Design Assistant (AIDA), by Bookmark, understands users' needs and desires to create an appropriate website for the user. In 2 minutes, AIDA designs the the website, and from that point it becomes a drag and drop operation
  - Software testing
    - Functionize enables users to test fast and release faster with AI enabled cloud testing. The users just have to type a test plan in English and it will be automatically converted into a functional test case
    - SapFix, AI Hybrid tool deployed by Facebook, can automatically generate fixes for specific bugs identified by *Sapienz*
  - GUI testing
    - Applitools is a GUI tester tool empowered by AI. The Applitools Eyes SDK automatically tests whether visual code is functioning properly or not
  - Using Artificial Intelligence in Strategic Decision-Making
    - AI Canvas for Strategic Decision Making helps identify the key questions and feasibility challenges in building and deploying ML models in the enterprise
  - Automatic Code generation/Intelligent Programming Assistants
    - Ask Bayou, that follows *neural sketch learning*, is an Intelligent programming assistant. It extracts knowledge from source code repositories like GitHub

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- How AI Will Change Software Development: 7 Things Software Leaders Should Know, 2021
  - Artificial Intelligence is Already Changing the Role of Software Developers
  - AI Enables Fully-Automated Software Testing at Speed Scale
  - AI-Powered Coding Helps Teams Build Apps Faster
  - Automated Error Management
  - Artificial Intelligence Technology Offers More Accurate Planning Cost Estimation
  - Artificial Intelligence Technology is Redefining What it Means to Be a Leader
  - AI Connects Developers to Real-Time Customer Feedback

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- References
  - 10 - The application of artificial intelligence in software engineering: a review challenging conventional wisdom, 2020
  - What Is Artificial Intelligence in Software Testing?, Jul-2020
  - The Current State & Future Trends of AI in Software Testing, Jan-2020
  - Ways of Applying Artificial Intelligence in Software Engineering, May-2018
  - The Role of Artificial Intelligence in Software Engineering, Jun-2012
  - Software Engineering Using Artificial Intelligence Techniques: Current State and Open Problems, Mar-2012
  - Innovative Applications of Artificial Intelligence Techniques in Software Engineering, 2010
  - Artificial intelligence and software engineering: a tutorial introduction to their relationship, Dec-1987

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- Software engineering for artificial intelligence and machine learning software: A systematic literature review, Nov-2020
- Software Engineering for Machine Learning: A Case Study, 2019

- **Artificial Intelligence Engineering**, *Software Engineering Institute, Carnegie Mellon University*
  - AI engineering is an emergent discipline focused on developing tools, systems, and processes to enable the application of artificial intelligence in real-world contexts
  - Pillars to AI Engineering
    - Human-centered AI
    - Scalable AI
    - Robust and Secure AI