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# The AI Effect: Working at the Intersection of AI and SE

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# Abstract

- The "The AI Effect: Working at the Intersection of AI and SE" is a paper that provides an overview of the impact of artificial intelligence (AI) on the field of software engineering (SE).
- The paper emphasizes the importance of considering ethical and social implications during the development and deployment of AI systems, and the need for software engineers to have the skills and knowledge necessary to address these issues.

The software engineers and researchers in the fields of AI and software engineering are the main population targeted in this paper.

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# Special Issue

As AI continues to disrupt many fields from agriculture to manufacturing, it's important to explore the essential connections between AI and software engineering. For this issue, the authors investigated AI in four primary areas:

1. *SE for AI*, The creation of AI software (How do we architect, build, maintain, deploy, test, and verify AI software?)
2. *SE by AI*, The application of AI to software engineering (How can AI help software engineers better do their jobs and advance the state of the practice?)
3. *SE with AI*, AI and software engineering in use (How have applications blended AI and software engineering so far?)
4. *SE in AI*, The AI landscape and its effect on software engineering (How do related topics such as AI technology investment, ethics, data collection, and security affect the work of software developers?)

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# Working in a Changing Landscape

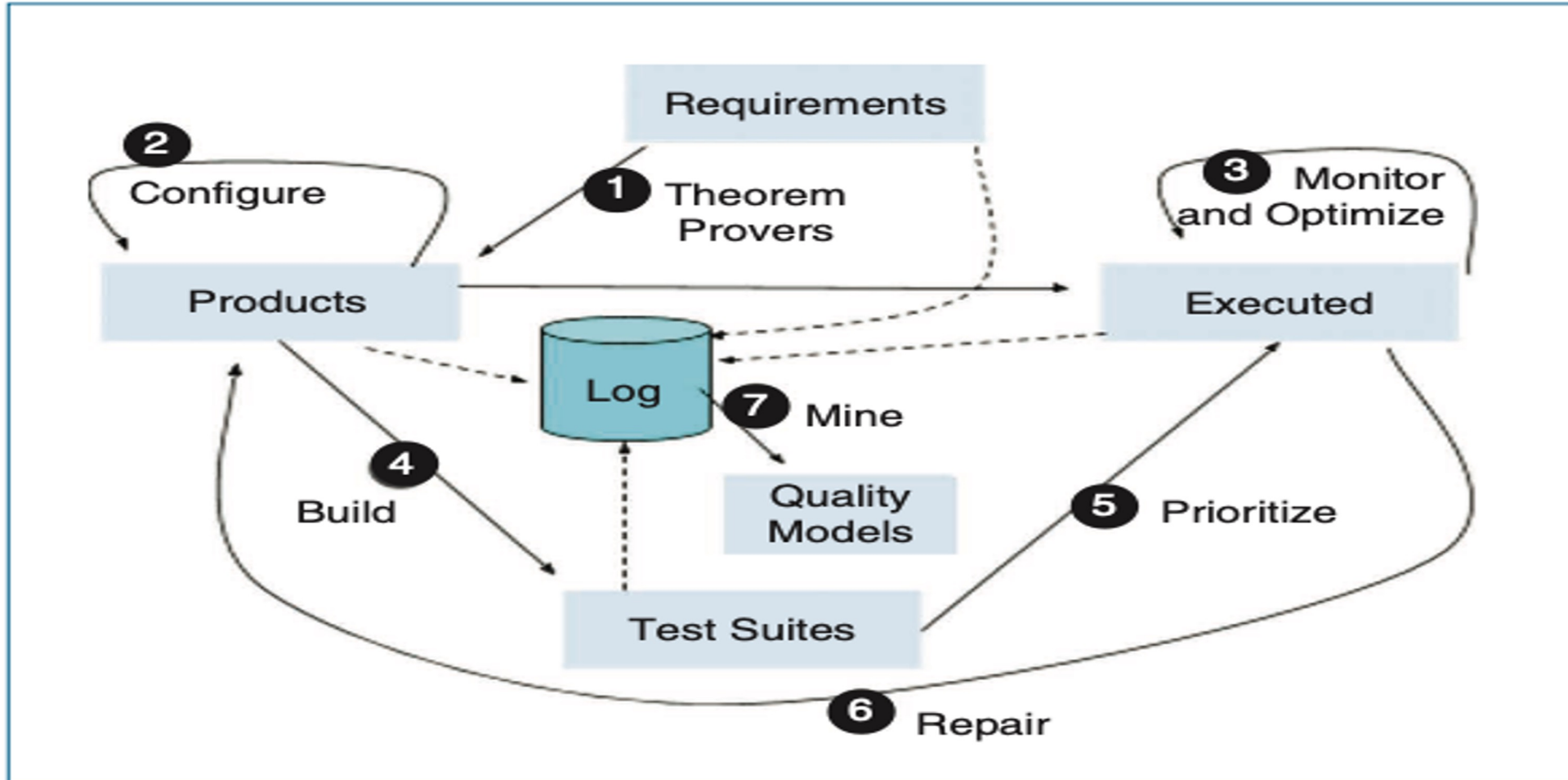
- Many large companies are opening their AI platforms to third-party developers. With everyone in the world having access to the same powerful AI tools, what effect will this have on software development as a whole?
- Ethics, too, is a growing concern. Some AI software has shown disturbing discrimination, and the rising use of deep learning means machine learning (ML) models are less explainable, making it harder to assess their reliability and trustworthiness.
- “Entire conference series are now dedicated to ethical considerations” says the authors. For more on the current status of AI, ethics, and current industrial practices, Mr Vakkuri has written an article for this special issue.

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# How Can AI Help Develop Software Better, Faster, and Cheaper?

- Applying AI to various SE tasks has already been shown to increase effectiveness and efficiency.
- For instance, much of SE is a process of picking what task to do next, such as when agile teams reflect on a Scrum backlog to decide which tasks are needed for the next sprint. Prior to the age of AI, that process of picking the next best action was a mostly manual process.
- However, the more we automate SE, the more we generate software artifacts that can be explored and executed automatically using AI tools.

# Using AI in the SE Lifecycle



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# The AI Infrastructure

- In 2020, what's exciting about AI and SE is that not only are the tools discussed in “Using AI in the SE Life cycle” possible, but those tools are supported by large-scale infrastructure. Some of that infrastructure is human based.
- Other parts of this infrastructure exist in software and hardware systems, many of which can be accessed on demand.
- Many vendors, such as Amazon Web Services, also offer easily accessible and affordable large-scale, cloud-based CPU and data storage facilities.

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# Principles to consider for an AI future

1. Just Say “No”?(Consider Avoiding the AI Hype)
2. Put Users Before Algorithms
  - Do you spend more time talking to users than fiddling with your AI software?
3. Fret About Ethics
  - Do you consider the ethical consequences of capturing software users’ data and have actions for removing and securing these data?
  - Do you treat ethics as both a software design consideration and a policy concern?
4. Plan for Scale
  - Are you using a large data mining toolkit that supports many kinds of learning algorithms? Successful AI engineers routinely try multiple AI methods.
  - Data ingestion, cleansing, protection, monitoring, and validation are necessary for engineering a successful AI system. Are you double- and triple checking that you are using the right data?



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## 5. Make It Better, Better, Better

- Did you incorporate user experience and interaction to constantly validate and evolve models and architecture?
- Do you define checkpoints to account for the potential needs of recovery, traceability, and decision justification?

## 6. Be Kind to Your Software

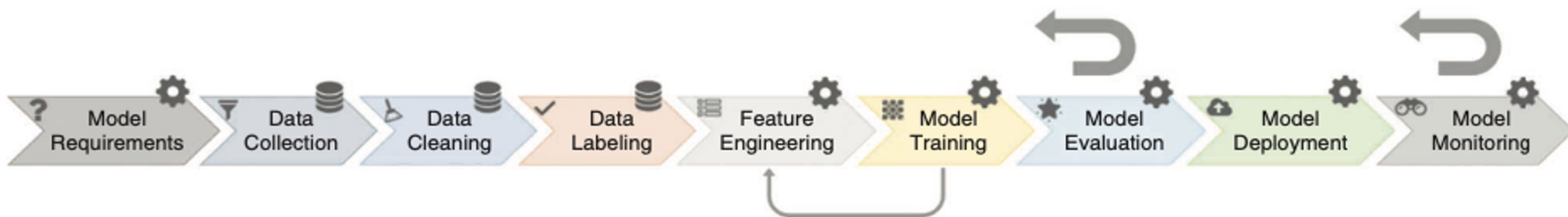
- On your project teams, for everyone inductive/knowledge engineer, are there at least two software/test/systems engineers?
- Do you know the tools everyone else says are the best? Do you use them?

## 7. Keep it Agile – Really

- Are you allowed to set up to get early feedback on your initial approach? Continuous and early feedback from users allows needed changes to be made as soon as possible (e.g., when assumptions don't match the users' perception) and without wasting heavy upfront investment.
- With that feedback, are you allowed to change the goals of the project?

## 8. Apply AI to Something You Know

- What is your process? Are you tracking your activity within that process?
- Are you defining and following your own AI software process? Writing software is more than just writing code, and writing AI software is more than just running a learner. For example, software analytics researchers at Microsoft offer a nine-step process for their own AI work.



## 9. Train for AI

- Do you train your engineers in AI?
- Do you teach your own R&D staff sufficiently to utilize these new technologies to improve their own work?

## 10. Organize for AI

- Figure out how humans and computers can build off each other's strengths.

# Strengths and Weakness

Strengths	Weakness
<ul style="list-style-type: none"><li>☐ The paper provides a comprehensive overview of the impact of AI on the field of software engineering, covering key areas such as programming languages, tools, and software systems.</li></ul>	<ul style="list-style-type: none"><li>☐ The paper provides a broad overview of the impact of AI on software engineering, but it may not provide enough in-depth analysis of specific topics or case studies.</li></ul>
<ul style="list-style-type: none"><li>☐ The paper places a strong emphasis on the ethical and social implications of AI systems, highlighting the importance of considering these issues during the development and deployment of AI systems</li></ul>	<ul style="list-style-type: none"><li>☐ The paper highlights the challenges associated with working at the intersection of AI and SE, but it may not provide specific solutions or recommendations to address these challenges</li></ul>
<ul style="list-style-type: none"><li>☐ The paper calls for increased collaboration between AI researchers, software engineers, and experts in ethics and social sciences to ensure that AI systems are developed and deployed in a responsible and ethical manner</li></ul>	

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# Major Findings

The authors had invited some contributions for this paper and among the numerous submissions they had and selected a few articles which cover a broad range of important issues about SE and AI. Some of them are:

- In “Software Engineering for Data Analysis”, Kim talks about the industrial applications of AI and SE practices need to change to better support that kind of analysis. She says we need better, easy to extend, easy to use specification techniques to facilitate debugging and testing.
- William C. Benton from Red Hat discusses systems issues relating to the deployment of AI tools.

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# Discussion points

- Are we entering an era of “programming 2.0” where code is mostly written, tested, and maintained by AI systems? And if so, what then is the role of humans in guiding AI to create software systems?
- How can we integrate AI software with existing software?
- Why is it important to consider ethical and social implications during the development and deployment of AI systems?

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# Personal Thoughts and Conclusion

- Attention to AI is growing across the entire world today, driven by increased computational power, advances in deep learning, and widespread access to powerful AI tools from the world's leading companies. That means it's also rapidly becoming part of the everyday work of software engineers.
- Also, I believe AI software is still software, and when it breaks, software engineers have to fix it.
- The paper calls for increased awareness and education about the ethical and social implications of AI, and for software engineers to have a deeper understanding of AI concepts and techniques, as well as the ethical and social issues surrounding AI.
- In my opinion this paper may not provide a detailed analysis of specific topics or solutions, and further research may be necessary to address these issues .

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Thank You!

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