

An Overview about PhUSE Machine Learning & Artificial Intelligence Team Project

Sairam Gorthi, PhUSE ML/AI team co-lead

Tanks to: Kevin Lee, Sam Tomioka, Tom Kalfas, Jay Gohel, Karnika Dalal and all ML/AI team members

Special Thanks to: Wendy Dobson, Lauren White and
Emerging trends and technologies working group
leadership

Overview:

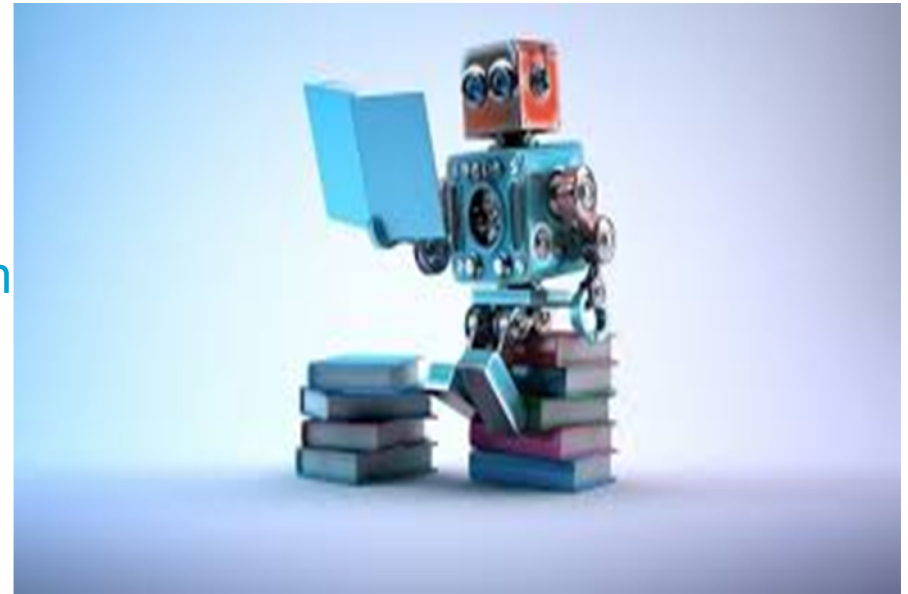
- PhUSE ML/AI team formed in December / January as sub-team in Emerging trends and technologies PhUSE working group.
- Initially started under Educating for the future working group last year
- To Spread the word about ML/AI team project and to welcome more contributors.

Agenda:

- Brief introduction to Machine Learning/Artificial Intelligence
- Machine Learning applications in our daily life
- ML/AI in Pharma industry
- PhUSE ML/AI team and Sub-teams
- Why ML/AI team project?
- Q and A

What is ML and AI?

- Artificial Intelligence (AI) is Intelligence demonstrated by machines, in contrast to intelligence displayed by humans
- Machine Learning is an application of artificial intelligence (AI) that provides systems the ability to automatically learn and improve from experience **without being explicitly programmed.**



Why is ML/AI so popular now?

- Automation
 - Andrew Ng: **“Pretty much anything that a normal person can do/think in < 1 sec, we can now automate with AI”**
 - Can enhance human labors
 - Cost effective
- Accurate – better than humans
- Can solve a lot of complex business problems.



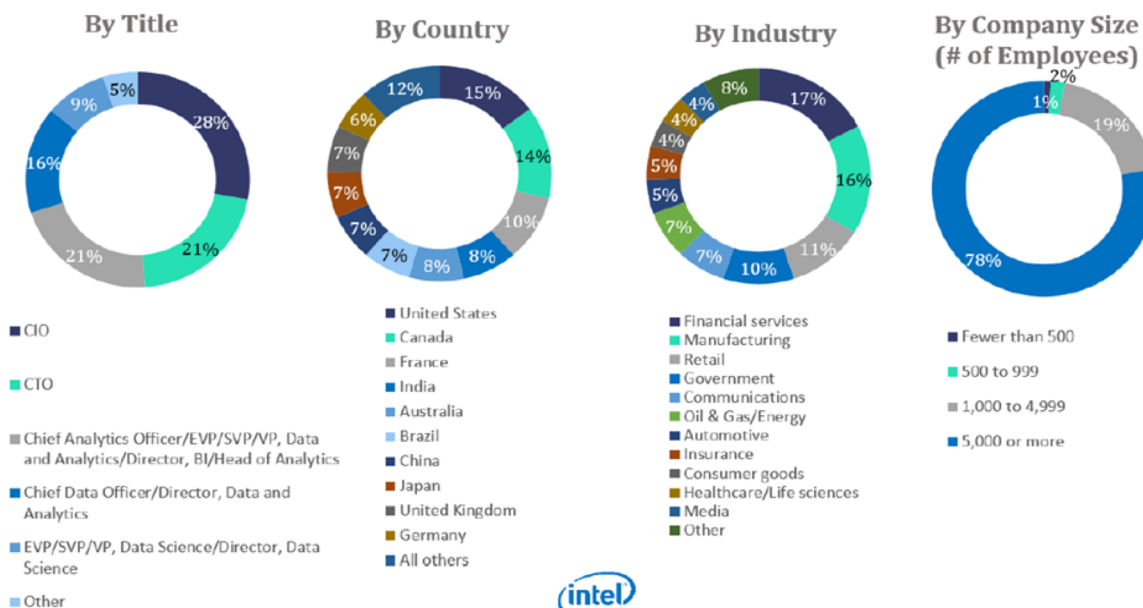
ML application to our daily life

- Voice Recognition System – Siri, Alexa, Google Home
- Recommendation – Amazon, Netflix, Spotify
- Customer Service – Chatbot (On-line chatting)
- Cashless Shopping – Amazon GO
- AlphaGO
- Autonomous vehicles

Adoption of ML/AI in Pharma

Forbesinsights

AI Momentum, Maturity & Models for Success



accenture

intel

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Groups

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Adoption of ML/AI in Pharma

- Slow
- Regulatory restriction
- Machine Learning Black Box challenge – need to build ML models, statistically or mathematically proven and validated, to explain final results
- Short in talents

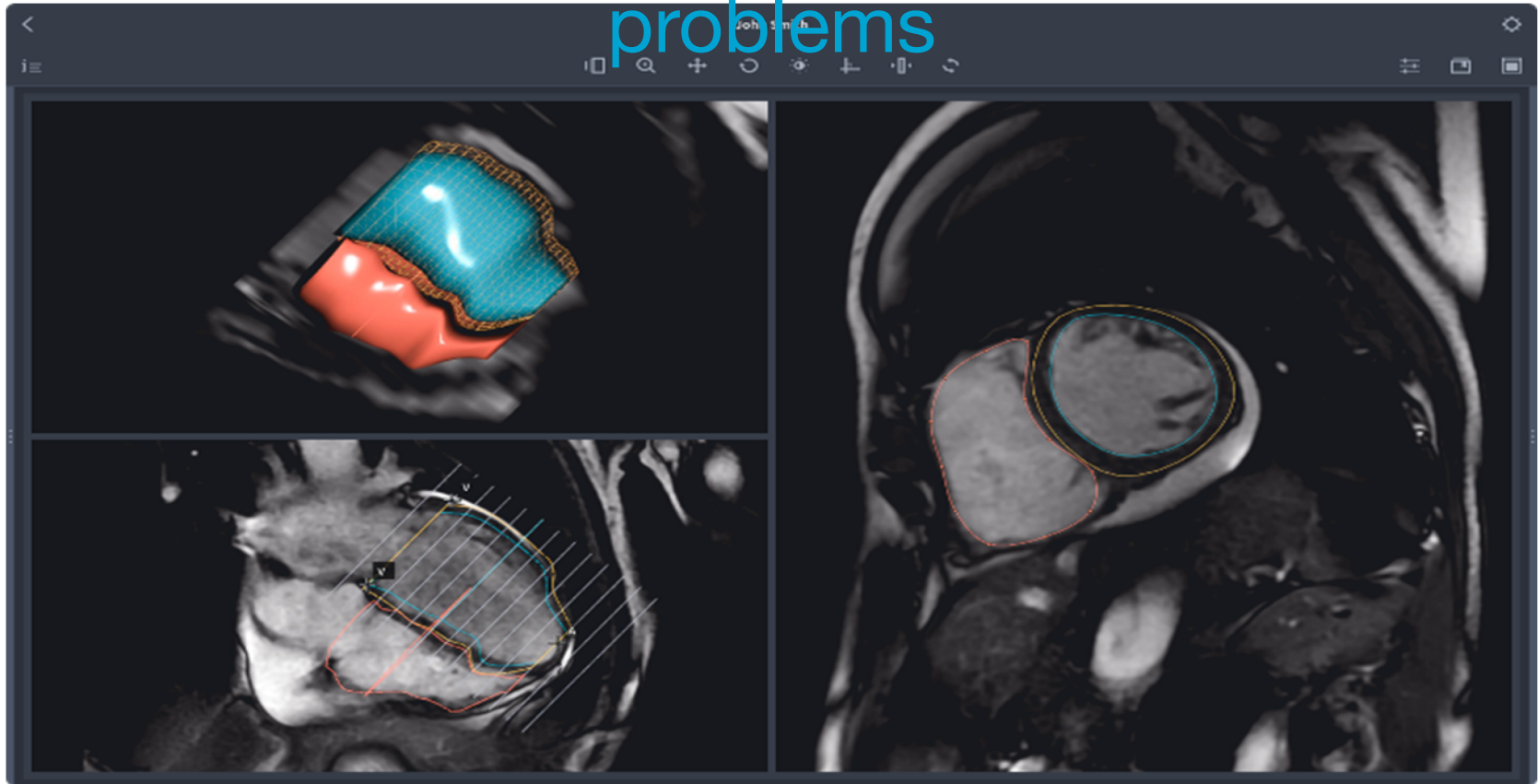
Healthcare ML/AI Market

- Us – 320 million in 2016
- Europe – 270 million in 2016
- 40 % annual rate
- 10 billion in 2024
- Nearly 1/3 of the world's data comes from healthcare
- a lot of AI start up aiming Pharma

ML Application in Pharma R&D

- Drug Discovery
- Drug candidate selection
- Clinical system optimization
- Medical image recognition
- Medical diagnosis
- Optimum site selection / recruitment
- Data anomaly detection
- Personalized medicine

FDA first approval on ML/AI: Artery's medical imaging platform to diagnosis heart problems



510K clearance by FDA on Artery's Oncology AI Suite



ML application in clinical trial data analysis?

- CRF design and annotation
- Medical coding
- Mapping specifications
- Edit Check
- SDTM
- ADaM
- TFL

Goals of Machine Learning & AI team project

- To spread awareness of Machine Learning in Pharmaceutical Industry
- To explore and learn ML applications in other industries and implement in Pharmaceutical Industry
- To bring existing ML/AI knowledge in pharma industry together
- To introduce ML education framework for Pharmaceutical Industry

Goals of Machine Learning & AI team project

- To collaborate across Pharma companies for actual ML projects
- To explore and conduct ML projects specific to biometrics
- To publish white papers and to present during conferences
- To conduct workshops

Machine Learning & AI Project Team Site

Machine Learning / Artificial Intelligence

Project Overview

The most popular buzz word nowadays in the technology world is 'Machine Learning' (ML) and Artificial Intelligence (AI). Most economists and business experts foresee ML & AI changing every aspect of our lives in the next 10 years through automating and optimizing processes such as self-driving vehicles, online recommendations on Netflix and Amazon, fraud detection in banks, image and video recognition, natural language processing, question answering machines (e.g., IBM Watson) and many more. ML is a game changer and it will also impact the pharmaceutical industry greatly; diagnosis in medical imaging, analysing the deluge of healthcare data, drug discovery, robotic surgery and personalised medicine for example.

This project will explore its application to the pharmaceutical industry. Our goal is first to introduce ML & AI to the pharmaceutical industry. ML & AI are foreign to most programmers and statisticians in the pharmaceutical industry. This project will help them to start ML & AI education materials. Secondly we will explore how ML & AI can foster innovative approaches in data-driven research and drug development, personalised medicines, faster drug discovery and many more.

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Project Leads

Name	Role	Organization	E-mail
Kevin Lee	Project Co-Lead	Clindata Insight	kevin.kyosun.lee@gmail.com
Sairam Gorthi	Project Co-Lead	J&J	sgorthi1@its.jnj.com
Lauren White	PhUSE Project Assistant	PhUSE	Lauren@phuse.eu

PhUSE Machine Learning & AI wiki at

http://www.phusewiki.org/wiki/index.php?title=Machine_Learning_/Artificial_Intelligence

Sub-teams

- Pharmaceutical Industry ML implementation / Application
- ML Project
- ML Publication
- ML Collaboration (New, open for leads and volunteers)

Pharmaceutical Industry ML implementation / Application Sub-team

Goals

1. To gather/identify existing ML/AI implementations in industry
2. To explore/propose future ML/AI implementation opportunities
3. To link/share/collaborate as appropriate with the other subteams

Pharmaceutical Industry ML implementation / Application Sub-team

(1) Notables – Existing	(2) Notables – Proposed	(3) Collaboration
ML/NLP for automation of CRF annotations	Enhanced site/patient recruiting	- Transitioning to new structure that should serve to more seamlessly share research and potential projects with “hands-on” project team - Nearly all members of research team looking to participate in POC project development
AI-driven drug discovery	Wearables and AI-assist in identification of patient health risk factors and proposed preventative measures	
ML and Deep Learning for auto-generation of SDTM and ADaM specs & datasets	Risk-Based Monitoring: Review of AEs w/logistical regression to identify clinical sites having issues	
ML, Deep Learning, and Computer Vision for auto-detection of cancerous cells		

Machine Learning Project Sub-team

Goals

1. To explore some of the possible Machine Learning projects and learn Machine Learning implementation.
2. To conduct the simple Machine Learning projects specific to Pharmaceutical industries.
3. To share findings and results with PhUSE community.
4. To publish the contents of Machine Learning projects

Machine Learning Project Sub-team

Current/Future Projects

- Development of Chatbot using IBM Watson Assistant
- SDTM development using Machine Learning algorithm – The project will explore how to develop SDTM using Machine Learning algorithm.
- ADaM mapping
- CRF Design
- Pharmacovigillence
- Image (X-ray) Recognition

Machine Learning Project Sub-team

Natural Language Processing (NLP)

- NLP – the technology that can meaningfully interpret and act on human language inputs.
- Current applications
 - Amazon's Alexa
 - Chatbot
- NLP allows systems (such as chatbot) to understand your message and respond appropriately.

Machine Learning Project Sub-team

NLP Implementation



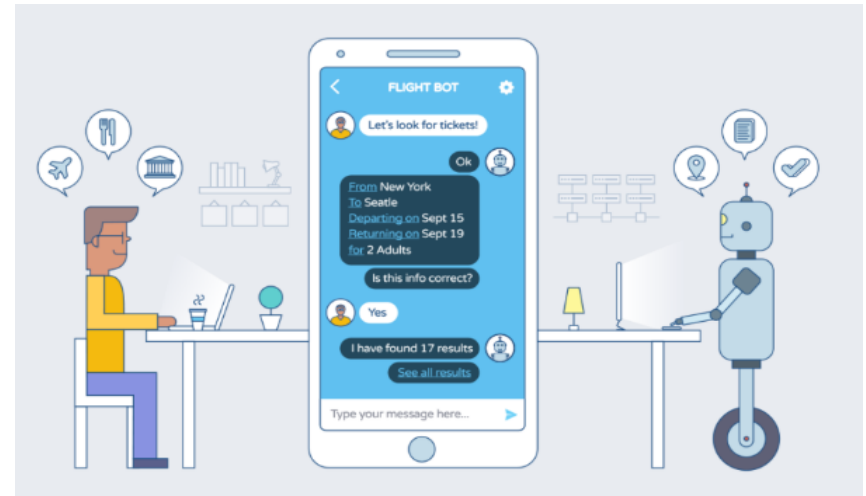
- Speech Recognition
- Machine Translation
- Video Activity Recognition
- Name Entity Recognition



Machine Learning Project Sub-team

Chatbot Creation

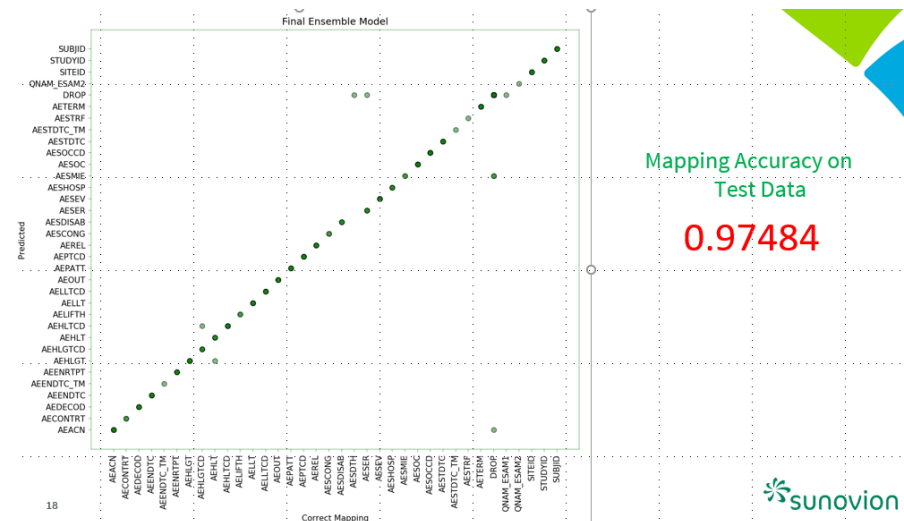
- One of current projects
- ML Algorithms – Natural Language Processing (NLP)
- Tool – IBM Cloud (IBM Watson Assistant)
- Exploring implementation for PhUSE website.



Machine Learning Project Sub-team

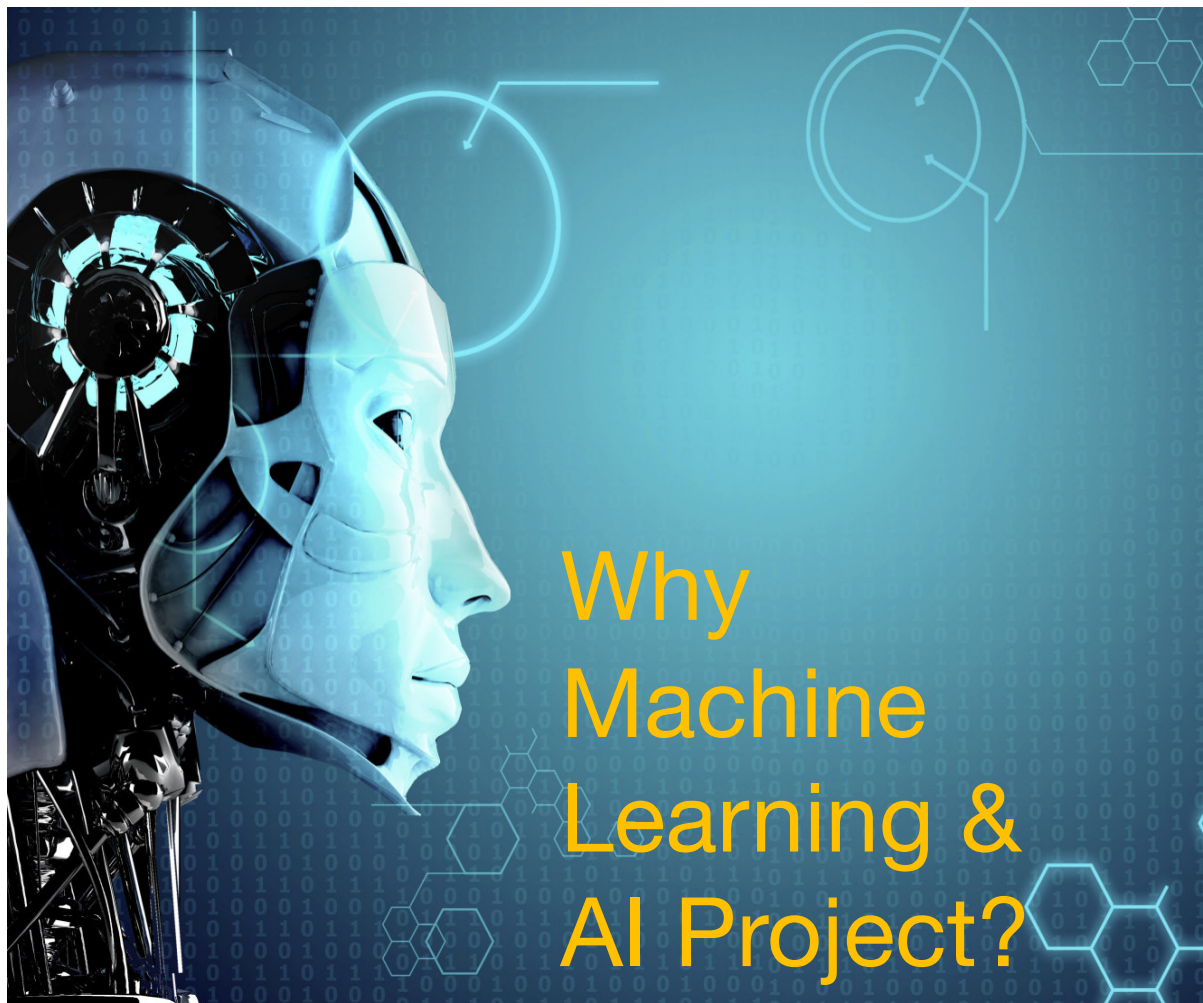
SDTM Mapping

- Project initiated based on the positive outcome of the POC presented at CDISC US Interchange 2018
- weighting scheme for word-variable matrices
- neural network language model
- Purpose
 - To explore and develop the SDTM mapping algorithms using NLP, ML, and NN.
 - To publish whitepaper on SDTM mapping

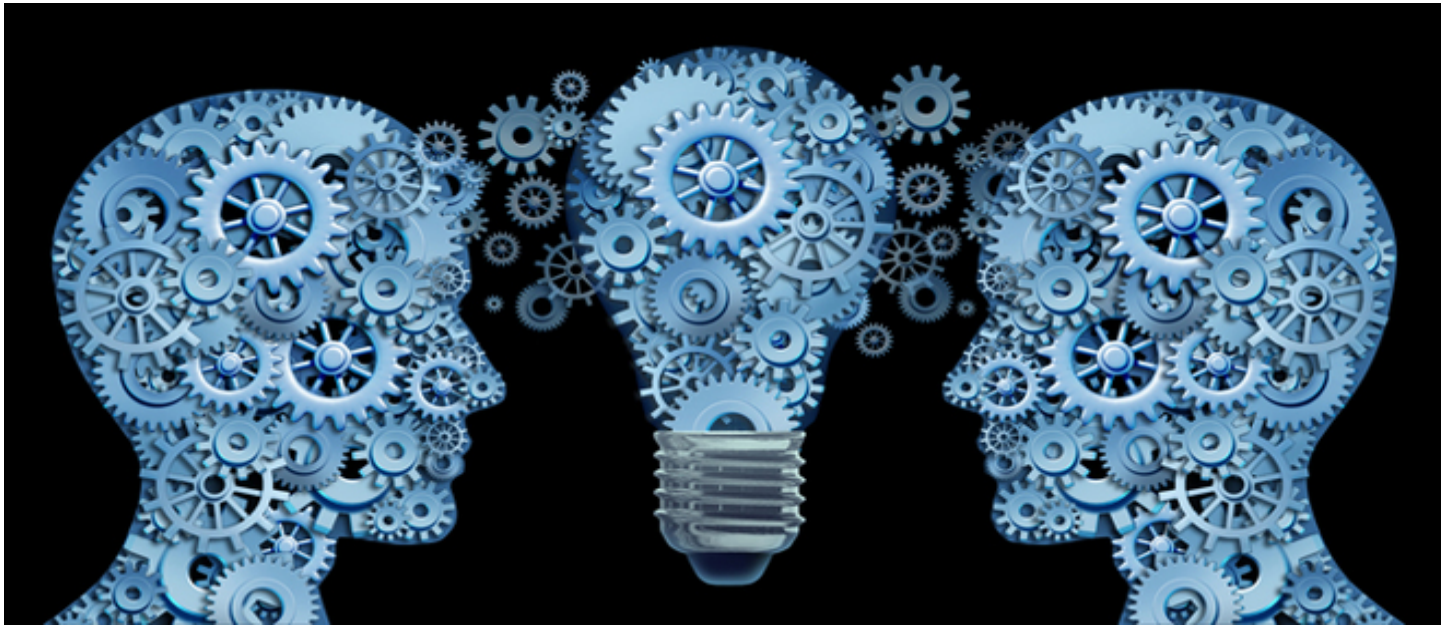


Publication Sub-team

- To participate in PhUSE activities such as conferences, CSS, SDE's or other conferences / meetings
- To publish ML/AI papers, presentation and White Papers of different ML/AI projects
- To publish ML/AI team updates



- Great opportunity to help and shape our industry by bringing ML/AI knowledge together
- Solve and provide solutions to common problems
- Make programming jobs easy and efficient
- Working with diverse teams and individuals
- To prepare ourselves for this next innovative and disruptive technology



- **Let's innovate together, please join ML/AI team!**
- **if interested in contributing please contact ML/AI team leads**

Machine Learning & AI Project Leads

- ML/AI team leads
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for people working in the
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