

*Microsoft AI & IoT Summit; September 2019*

# IoT and AI around the globe with Azure

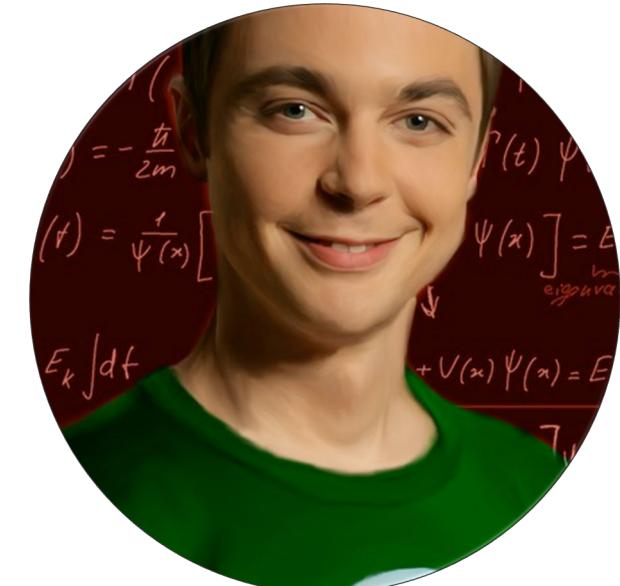
Dr. Lydia Nemec  
(Carl Zeiss AG)



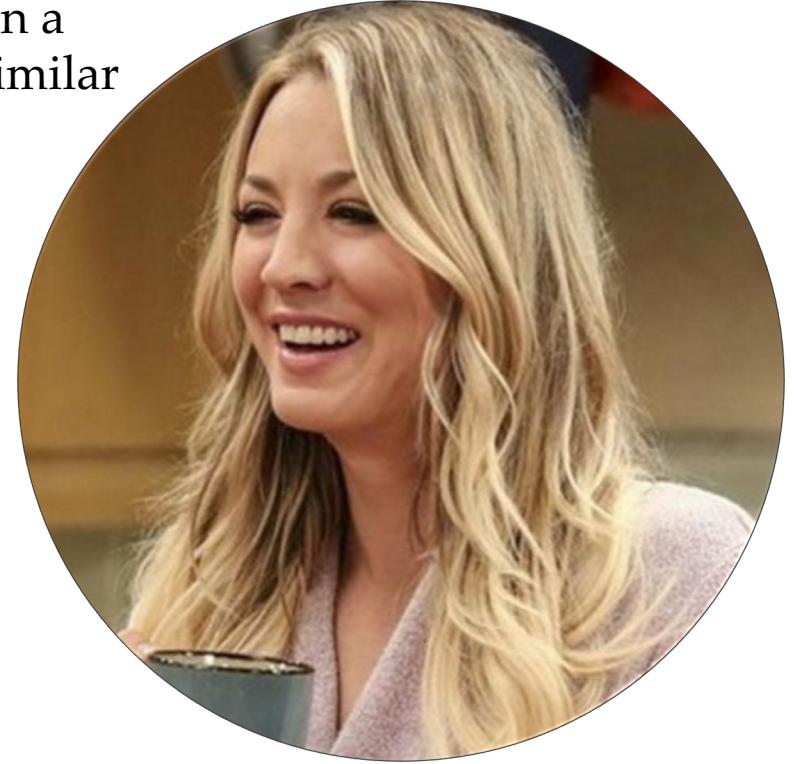
Dr. Lydia Nemec  
Data Scientist @ Zeiss  
Theoretical Physicist by training



but I come in a  
wrapping similar  
to Penny



I am a bit like  
Dr. Sheldon Cooper,

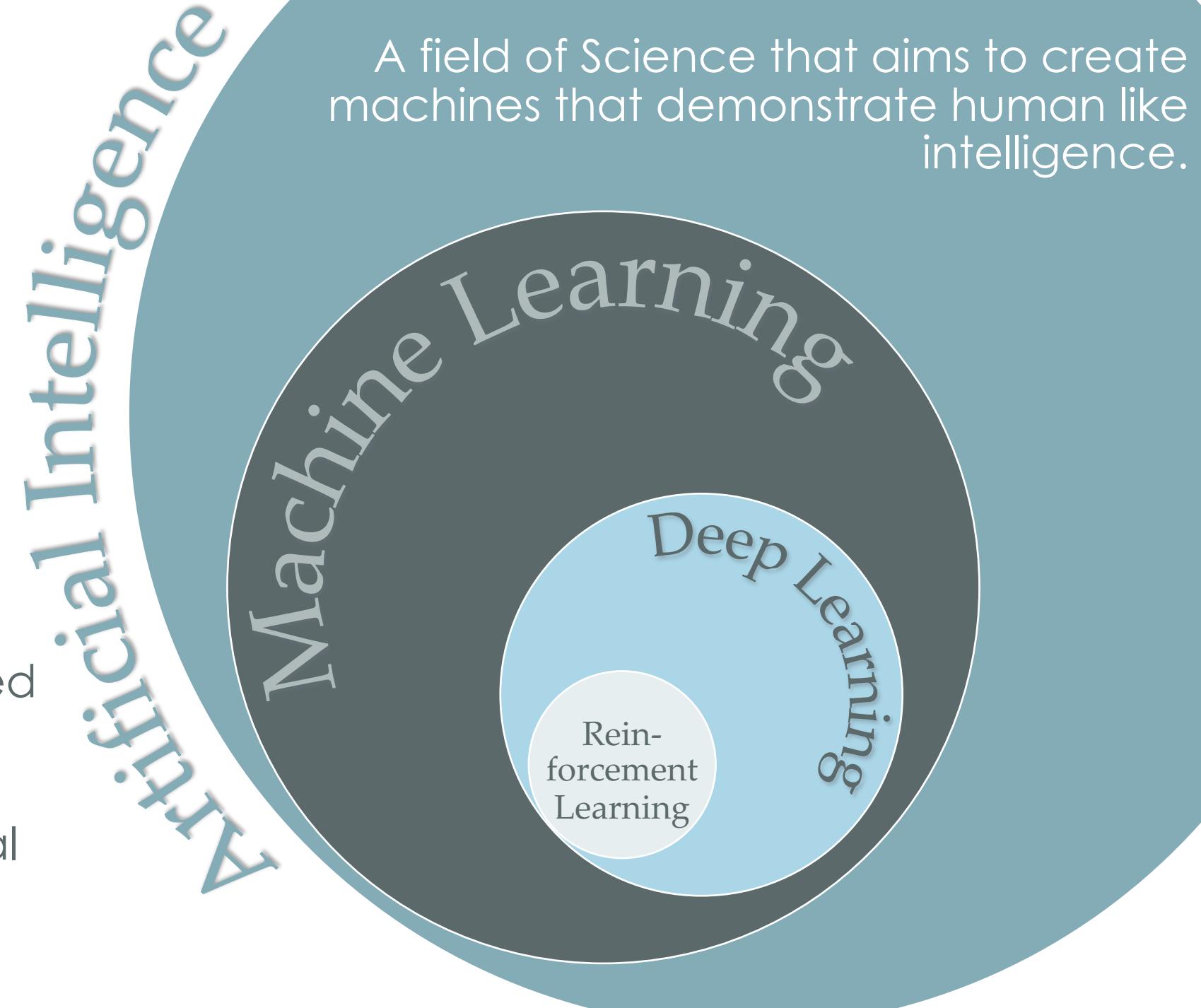




What is AI?

**Machine Learning** refers to a set of algorithms that allow computers to learn from data without being explicitly programmed.

**Deep Learning** is part of a broader family of machine learning methods based on artificial neural networks. It belongs to the class of hierarchical learning algorithms.

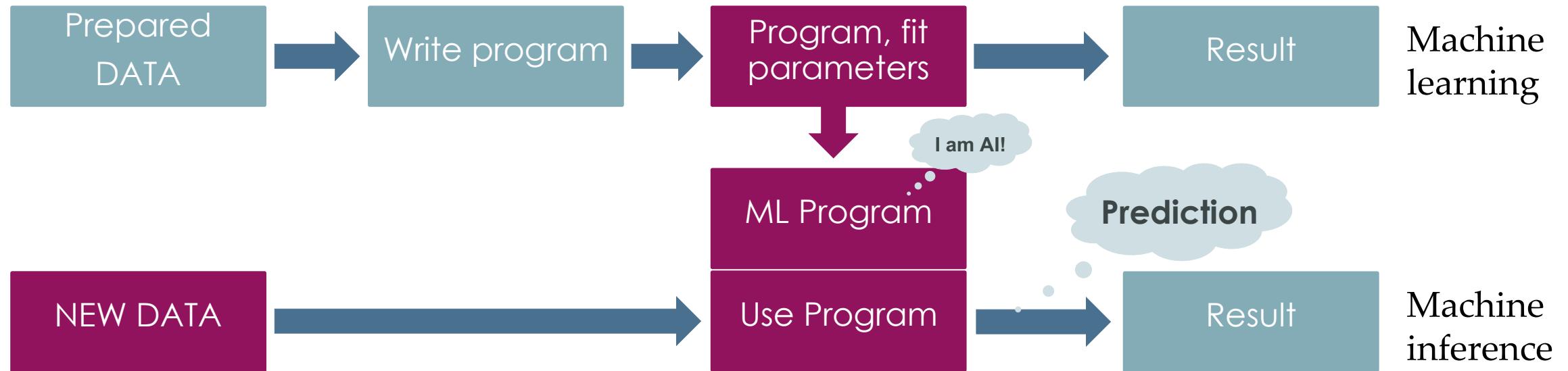


# Machine Learning: A different way of software development

## Traditional Software



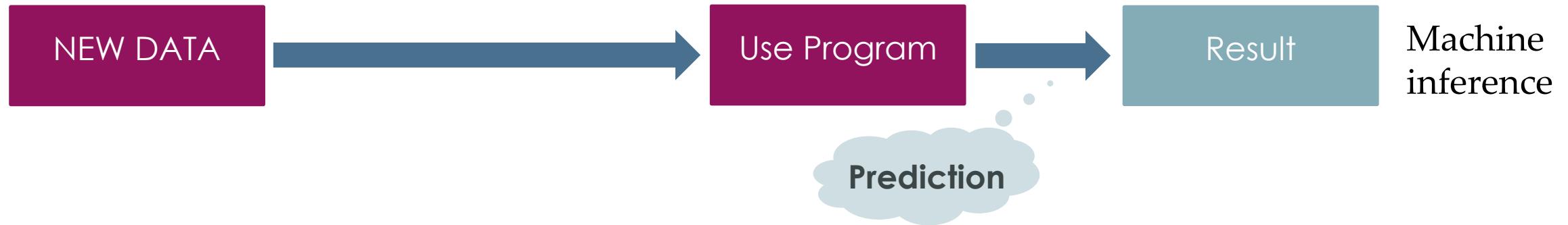
## Machine Learning Software



# Machine Learning: What do we mean with “Prediction”?

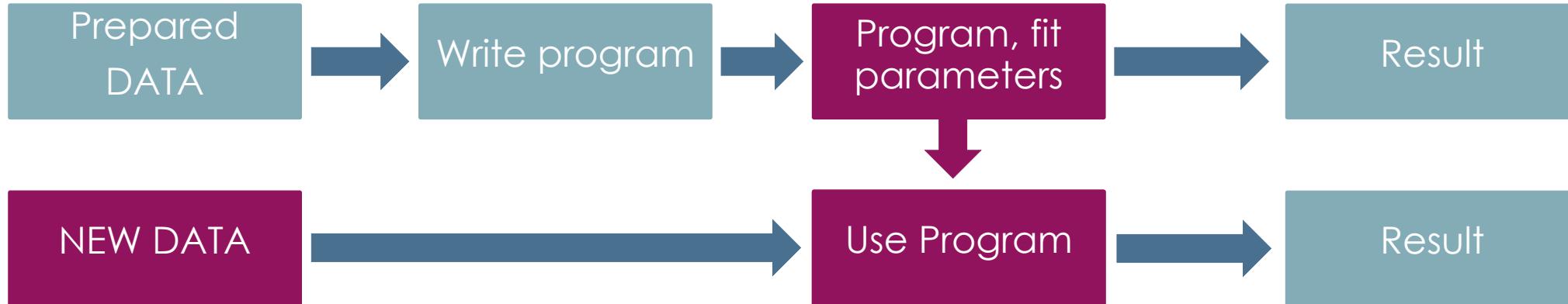
Prediction  
is the process of filling in missing information!

Prediction takes information you have, often called "data",  
and uses it to extract information you need.



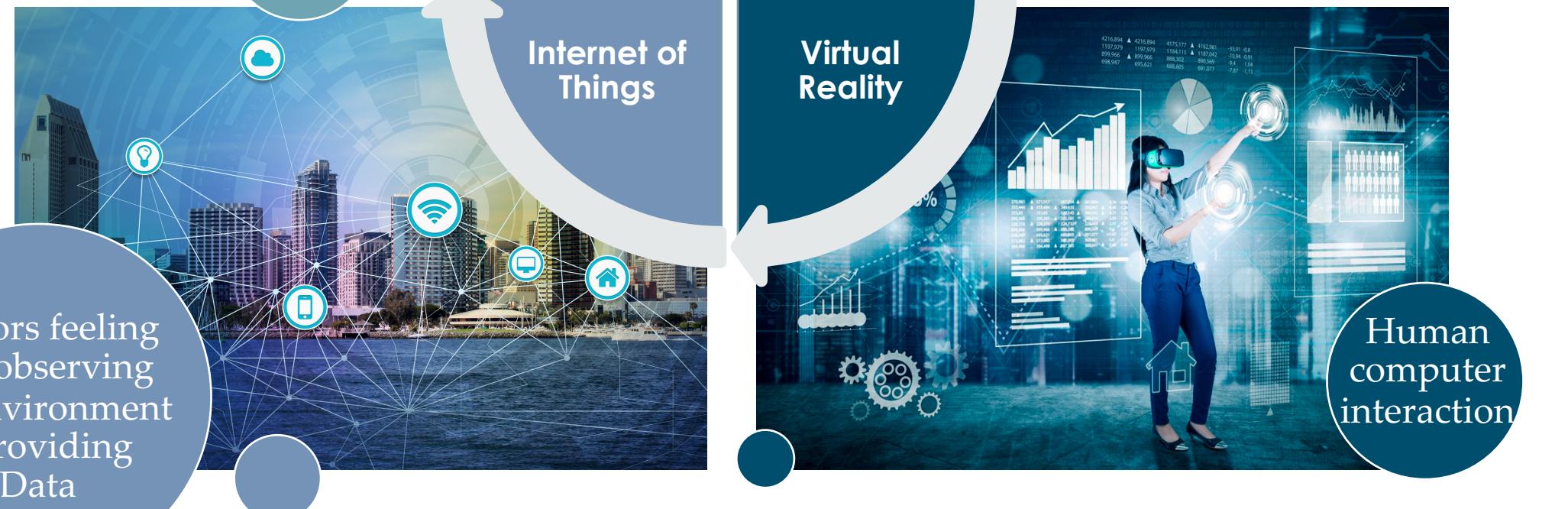
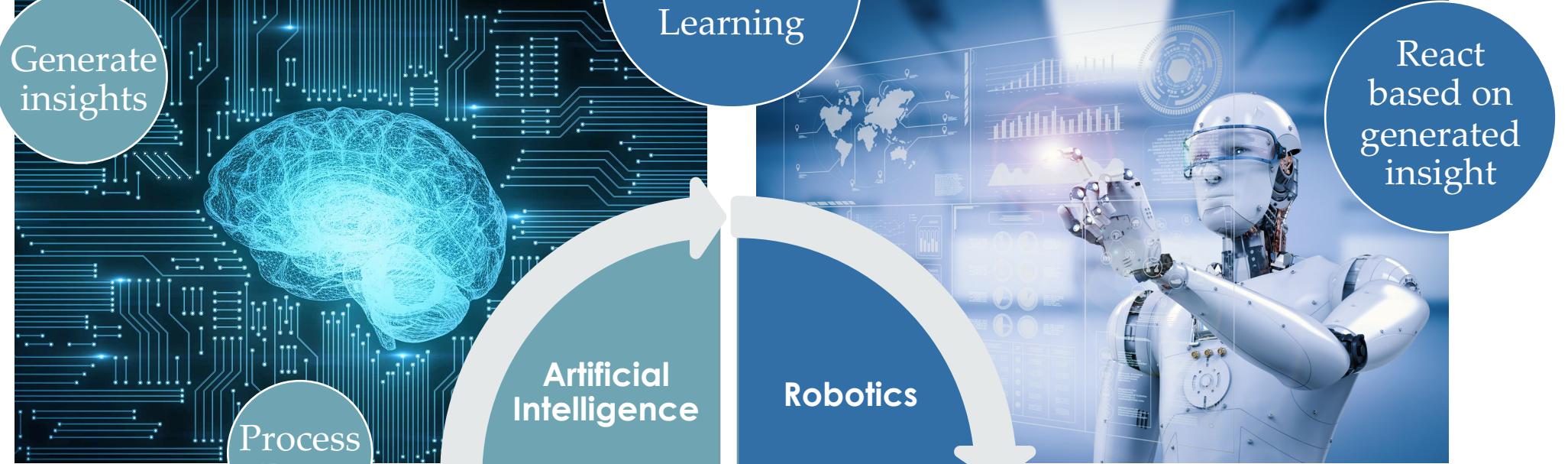
# Machine Learning cost asymmetry in training and inference

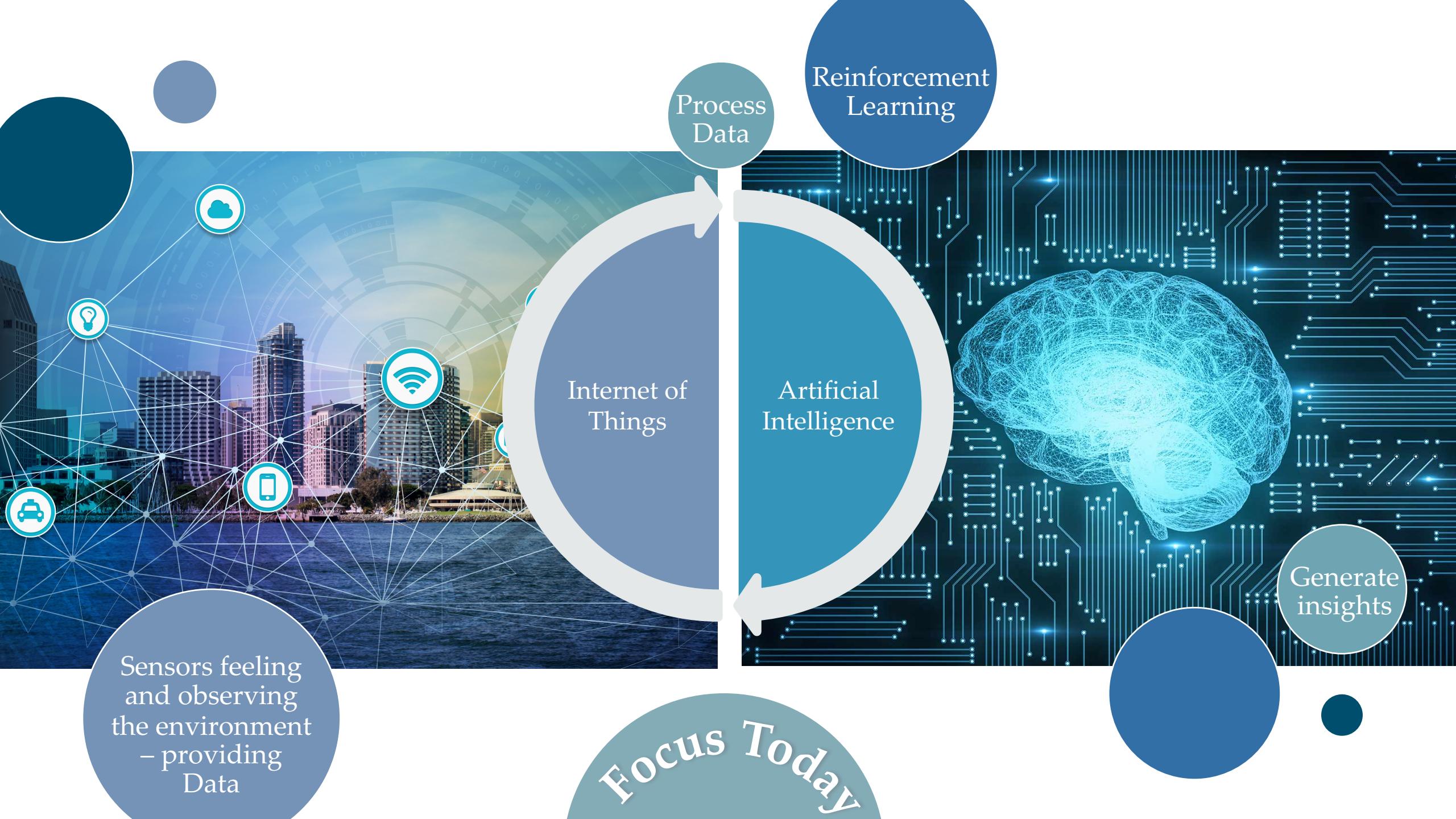
## Machine Learning Software





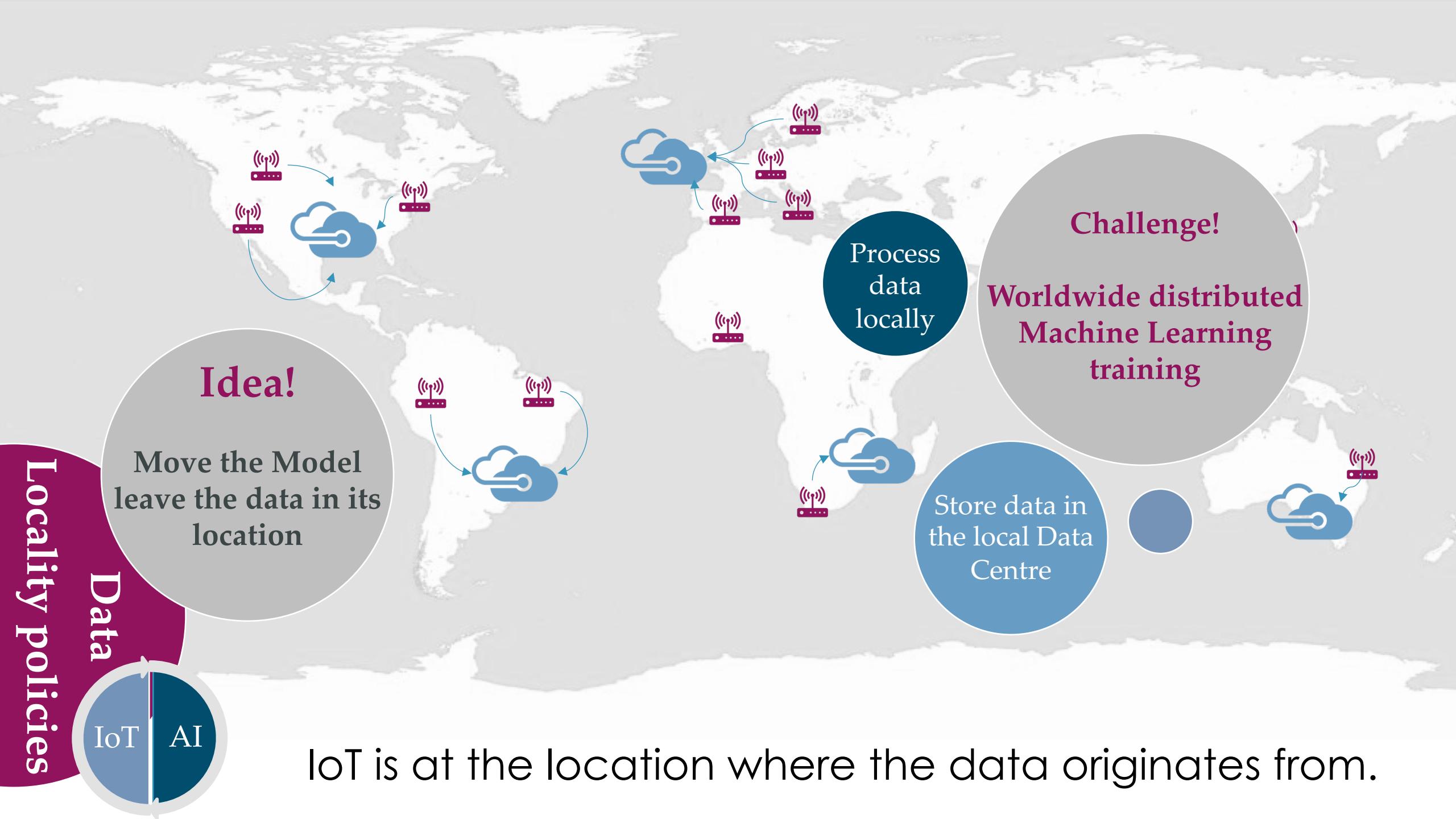
The connection  
between  
IoT and AI?





# Internet of Things: Keeping data local



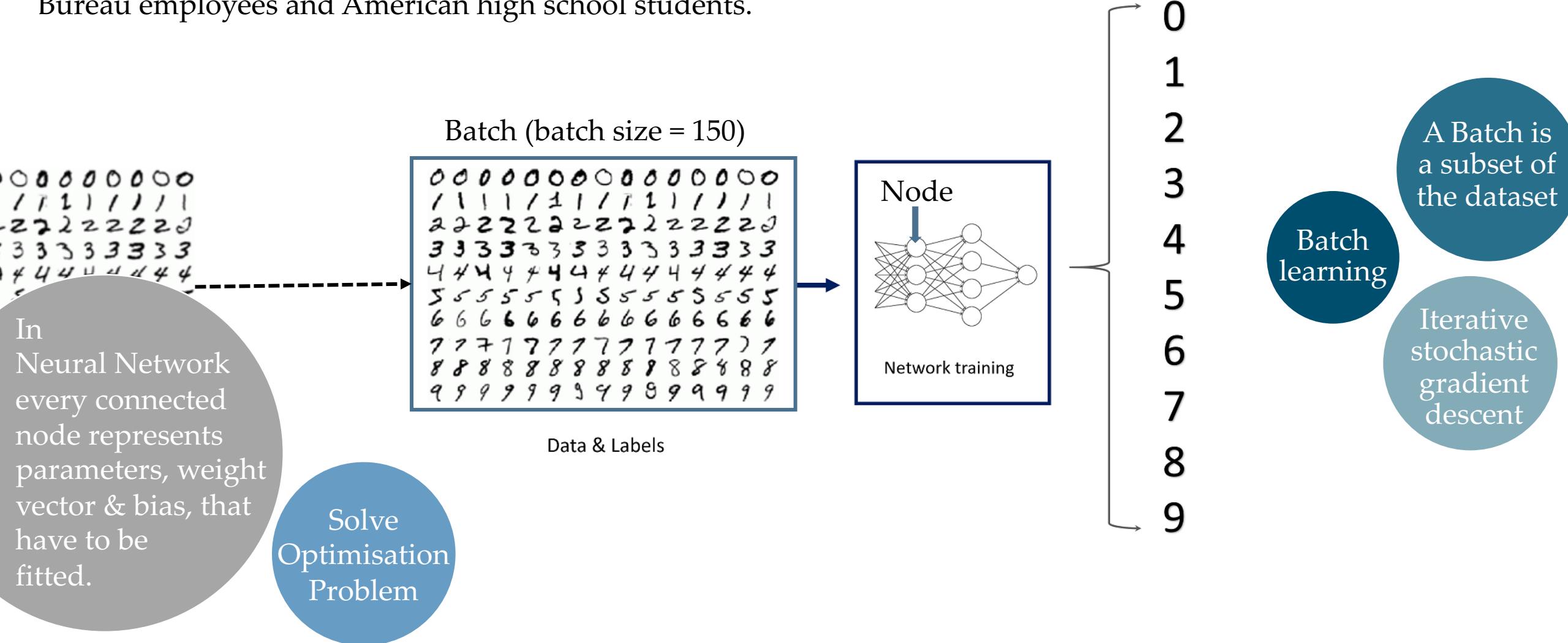




AI around  
the globe  
with Azure

# Getting to know the MNIST Dataset and Number classification

The MNIST database contains 60,000 training images and 10,000 testing images taken from American Census Bureau employees and American high school students.



# How big is the data volume of the model? A rough estimation

The MNIST database contains 60,000 training images.

In Neural Network every connected node represents parameters, weight vector & bias, that have to be fitted.

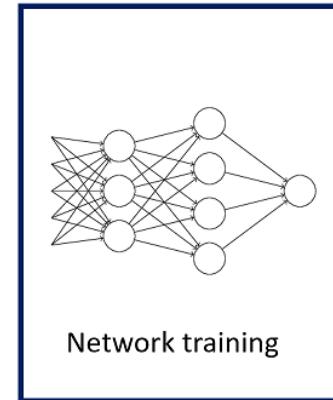
The model size is driven by the number of parameters

Solve Optimisation Problem

0 0 0 0 0 0 0 0 0 0 0 0  
1 1 1 1 1 1 1 1 1 1 1 1  
2 2 2 2 2 2 2 2 2 2 2 2  
3 3 3 3 3 3 3 3 3 3 3 3  
4 4 4 4 4 4 4 4 4 4 4 4  
5 5 5 5 5 5 5 5 5 5 5 5  
6 6 6 6 6 6 6 6 6 6 6 6  
7 7 7 7 7 7 7 7 7 7 7 7  
8 8 8 8 8 8 8 8 8 8 8 8  
9 9 9 9 9 9 9 9 9 9 9 9

Data & Labels

~ 20 kB



0  
1  
2  
3  
4  
5  
6  
7  
8  
9

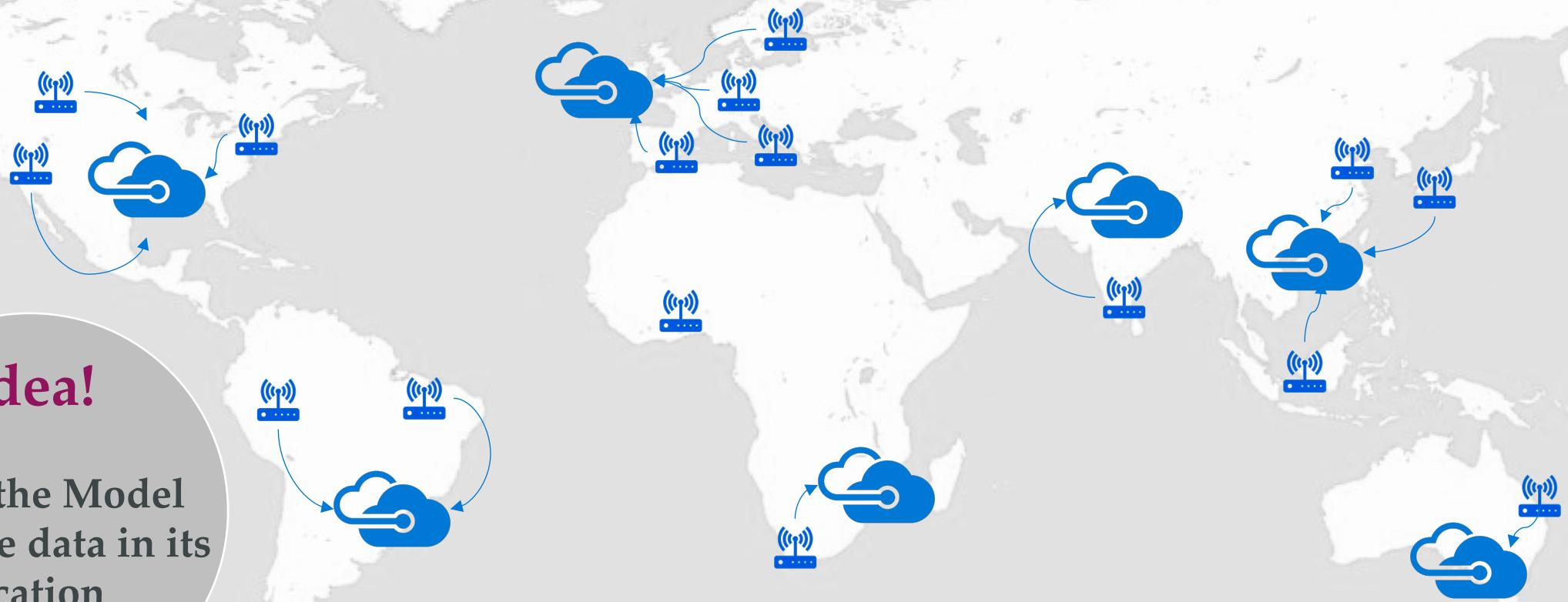
Nonlinear algorithms need more data: hard to estimate factor  $x_3$

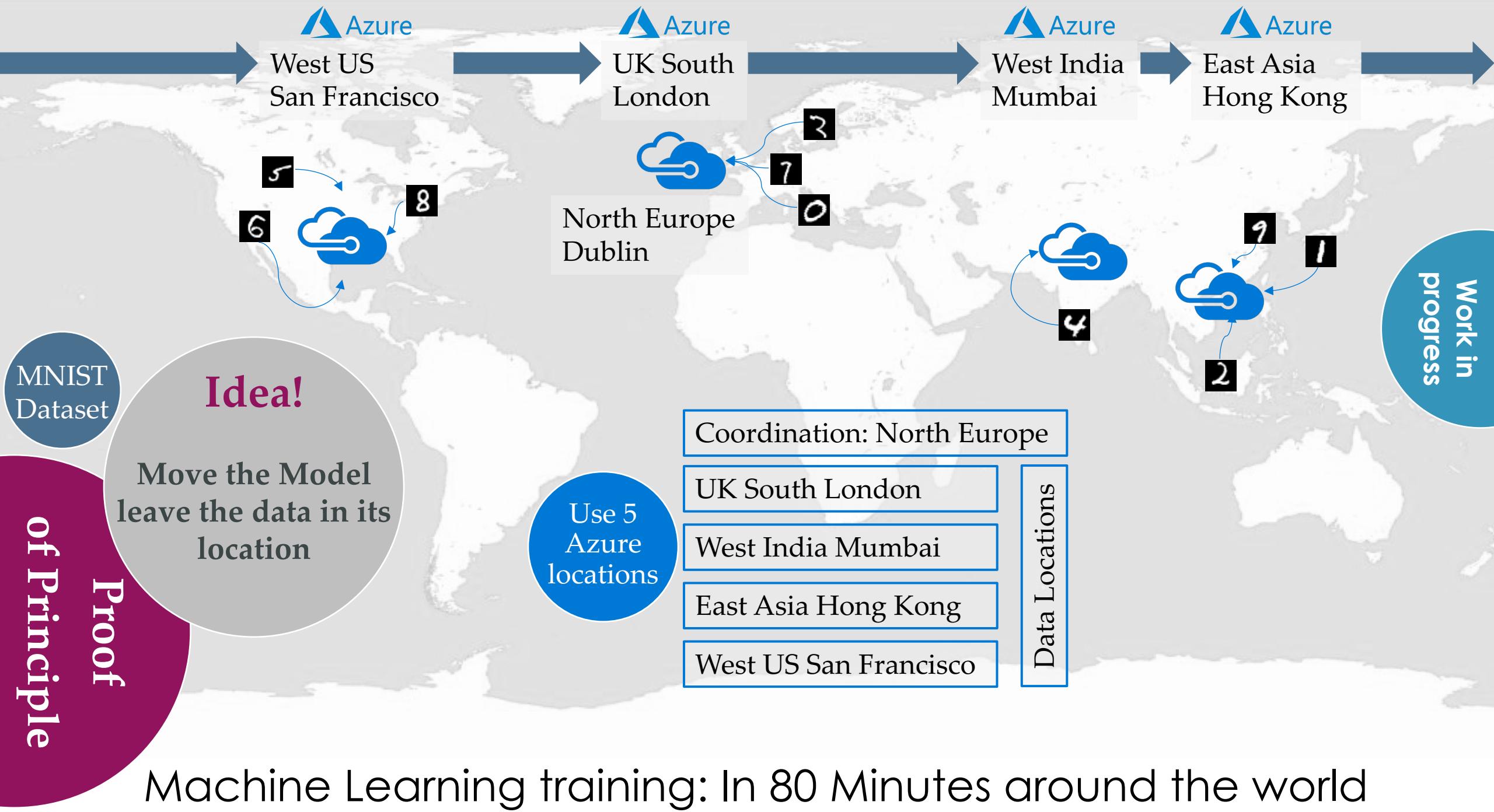
There must be  $x_1$  independent examples for each class, where  $x_1$  could be tens, hundreds, or thousands

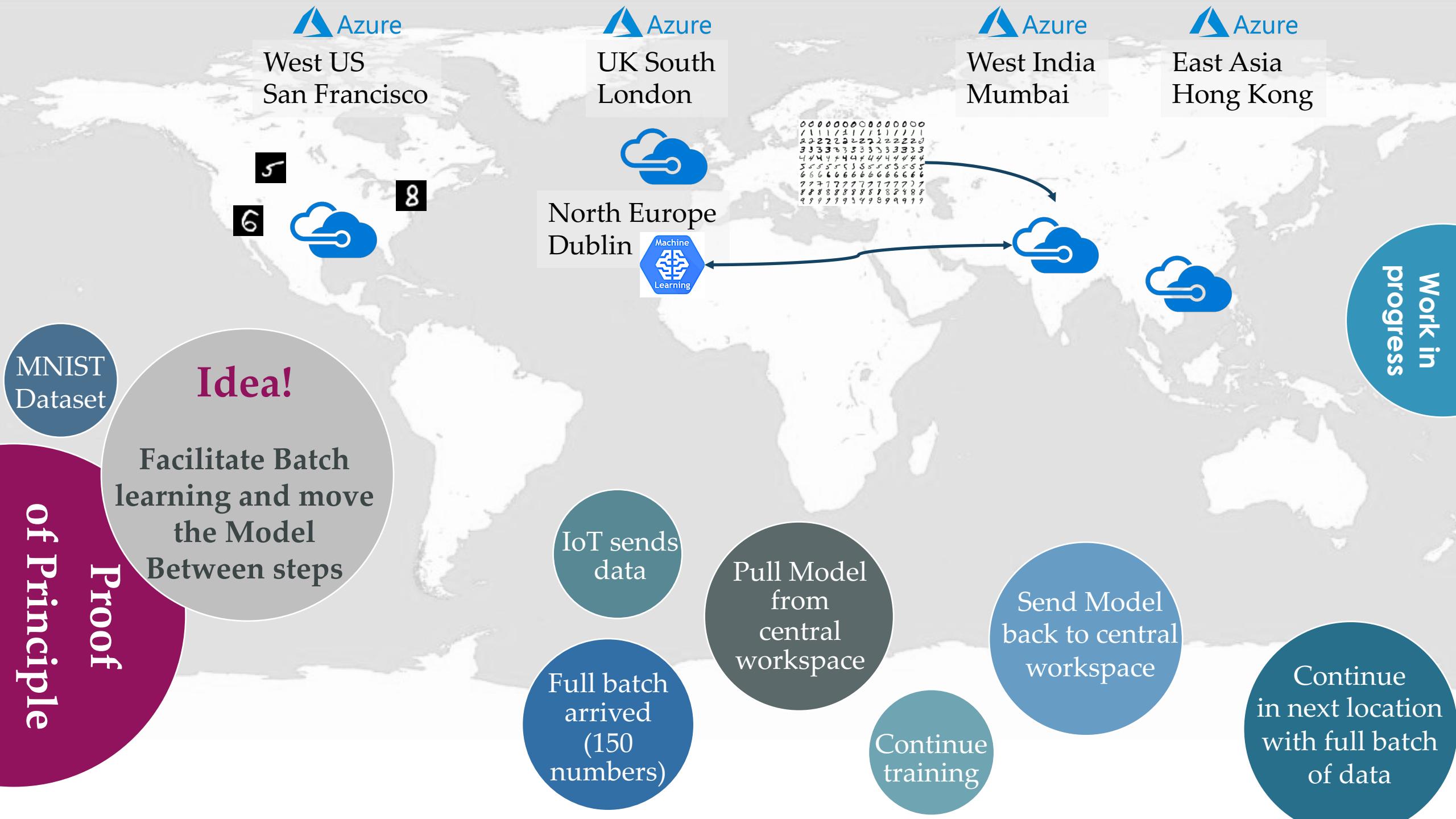
There must be  $x_2$  independent examples for each model parameter in the model, where  $x_2$  could be tens (e.g. 10).

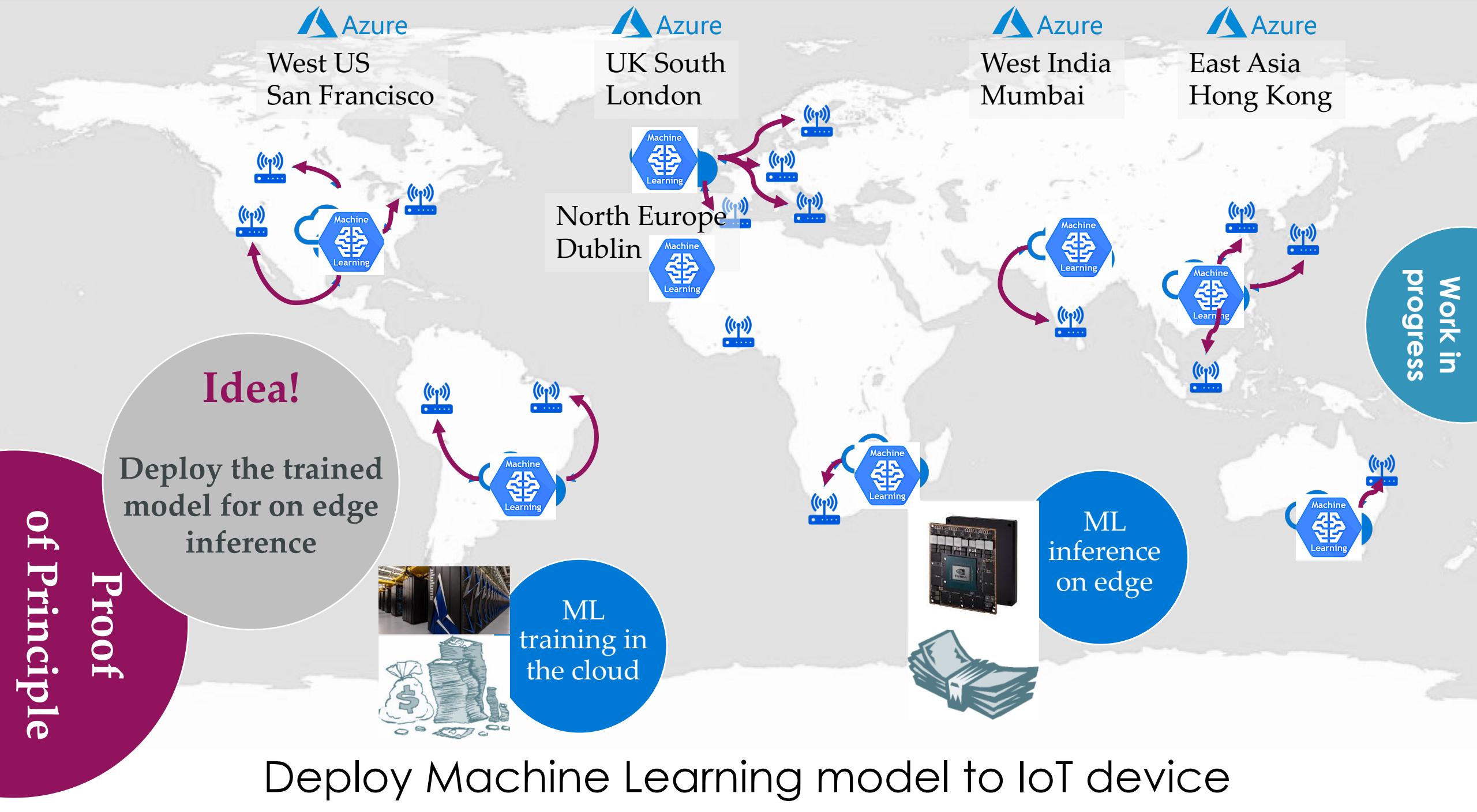
**Idea!**  
Move the Model  
leave the data in its  
location

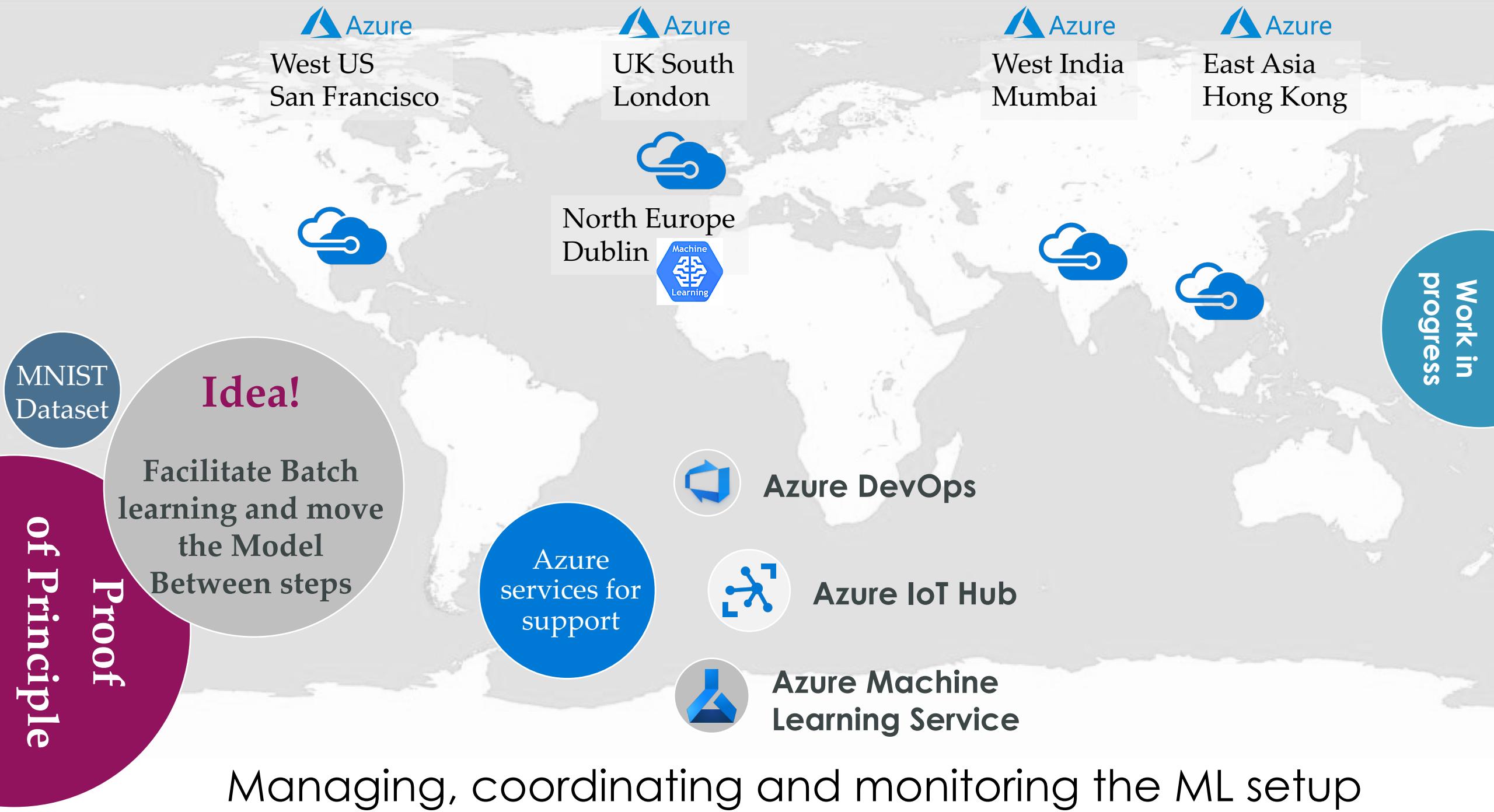
Worldwide distributed Machine Learning training







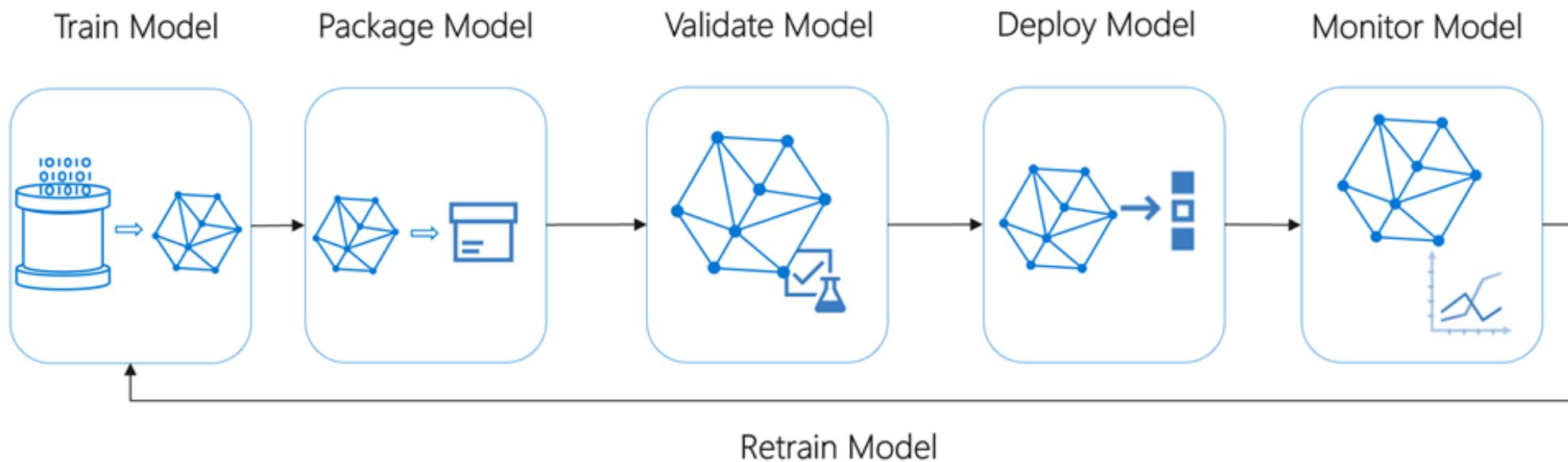






The tooling

# Microsoft Azure Machine Learning Service



# Machine Learning: A different way of software development



# Machine Learning: A different way of software development

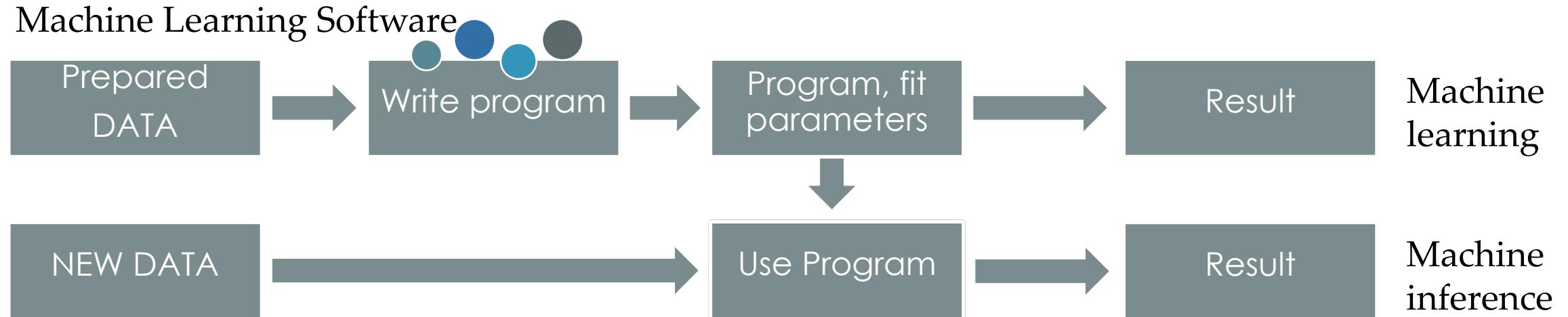


# Machine Learning: A different way of software development

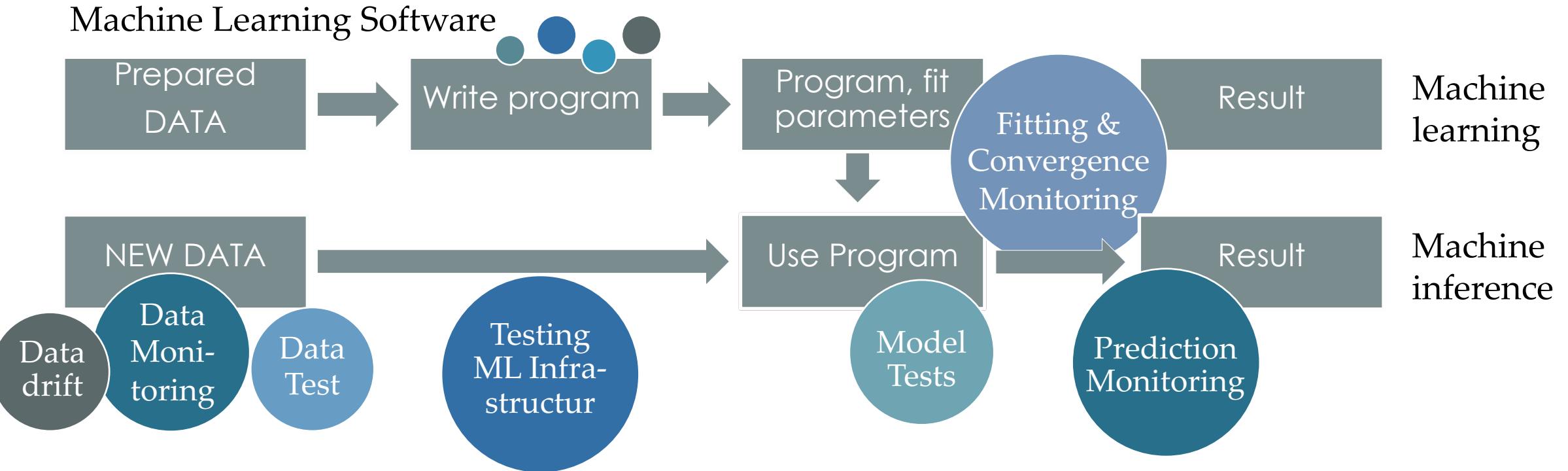
## Traditional Software



## Machine Learning Software



# Machine Learning: A different way of software development



# Microsoft Azure DevOps

## Azure DevOps Documentation

Azure DevOps provides development collaboration tools including high-performance pipelines, free private Git repositories, configurable Kanban boards, and extensive automated and continuous testing capabilities. You can access these tools through our cloud service, Azure DevOps Services, or on-premises platform, Azure DevOps Server (previously named Visual Studio Team Foundation Server).



- Get started**
- What is Azure DevOps?
- Azure DevOps Services
- Azure Boards
- Azure Repos
- Azure Pipelines
- Web portal navigation
- Search across Azure DevOps



- GitHub integration**
- GitHub & Azure Boards
- GitHub & Azure Pipelines
- GitHub & Azure DevOps Projects



- Azure Repos**
- What is Azure Repos?
- Git repositories
- Team Foundation version control
- Online lab



- Azure Boards**
- What is Azure Boards?
- Work items
- Boards
- Backlogs
- Sprints
- Queries
- Plans
- Scale
- Online lab



- Azure Pipelines**
- What is Azure Pipelines?
- Create your first pipelines
- YAML Schema
- Artifacts
- Tasks
- Deploy to Azure VMs
- Online lab



- Build and deploy apps**
- .NET Core
- Anaconda
- Android
- ASP.NET
- C/C++ with GCC
- C/C++ with VC++
- Docker
- Go
- Java
- JavaScript and Node.js
- ...plus more



- Azure Test Plans**
- What is Azure Test Plans?
- Manual testing
- Exploratory testing & stakeholder feedback
- Continuous testing
- Unit and functional testing
- Online lab

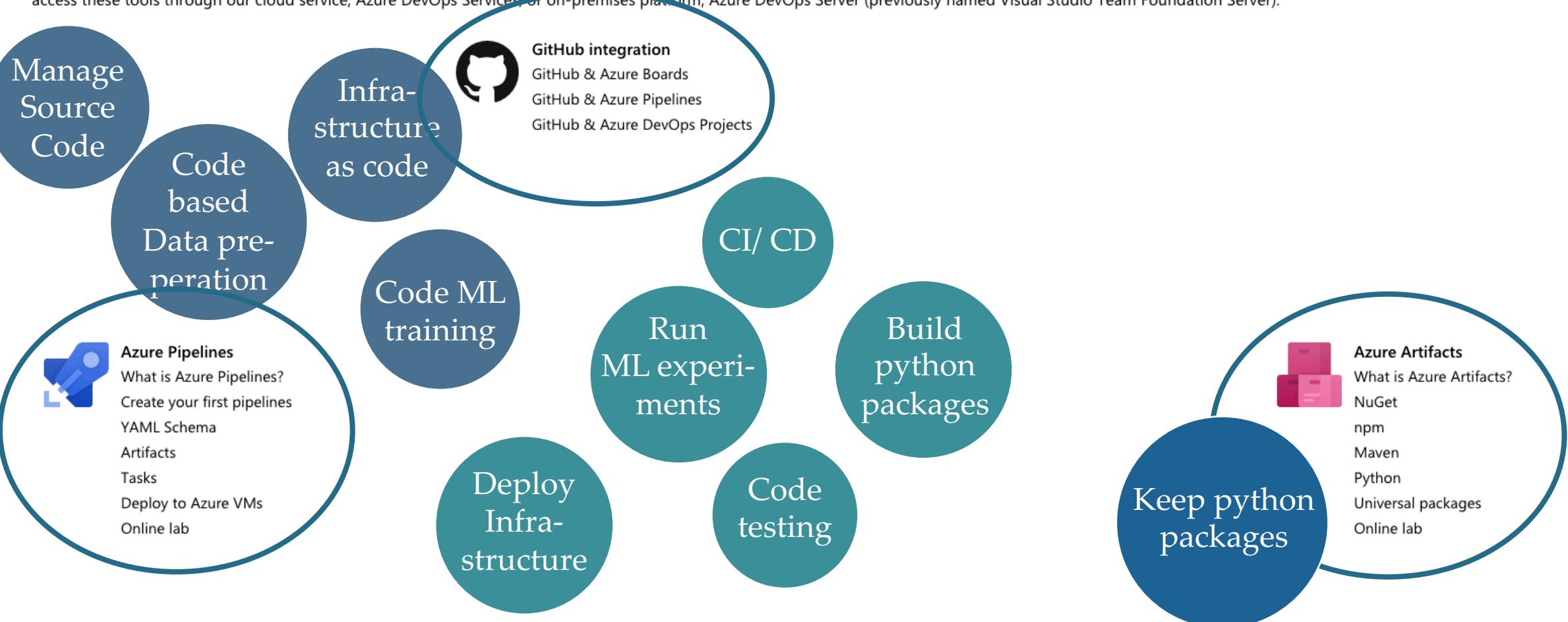


- Azure Artifacts**
- What is Azure Artifacts?
- NuGet
- npm
- Maven
- Python
- Universal packages
- Online lab

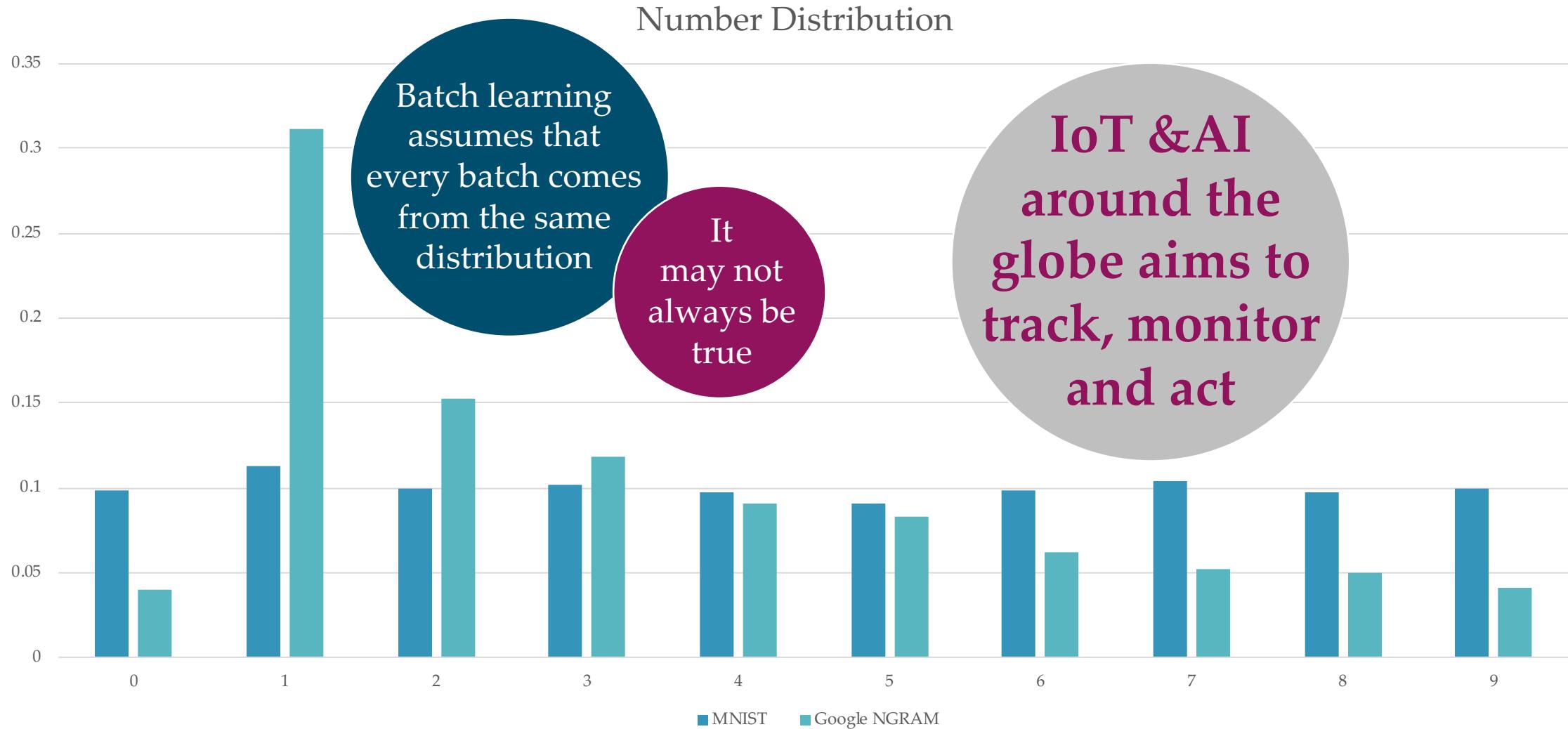
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# The biggest challenge is the distributed learning itself!





Dr. Lydia Nemec  
Data Scientist @ Zeiss



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[@LydiaNemec](https://twitter.com/LydiaNemec)

# Thank you for your attention