



# Responsible AI with MLOps

Ian Choi  
Microsoft

Values AI needs to respect



Fairness



Reliability  
& Safety



Privacy &  
Security



Inclusiveness



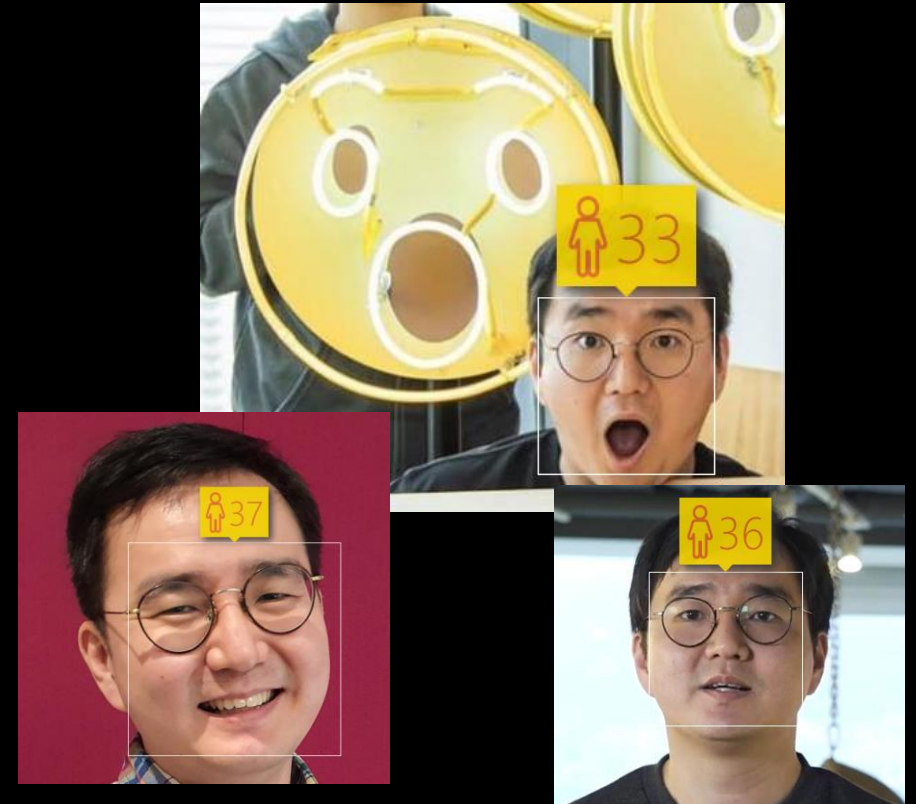
Transparency



Accountability

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  @ianychoi



# Responsible AI : complex & broad topic

Deployment  
& Ops



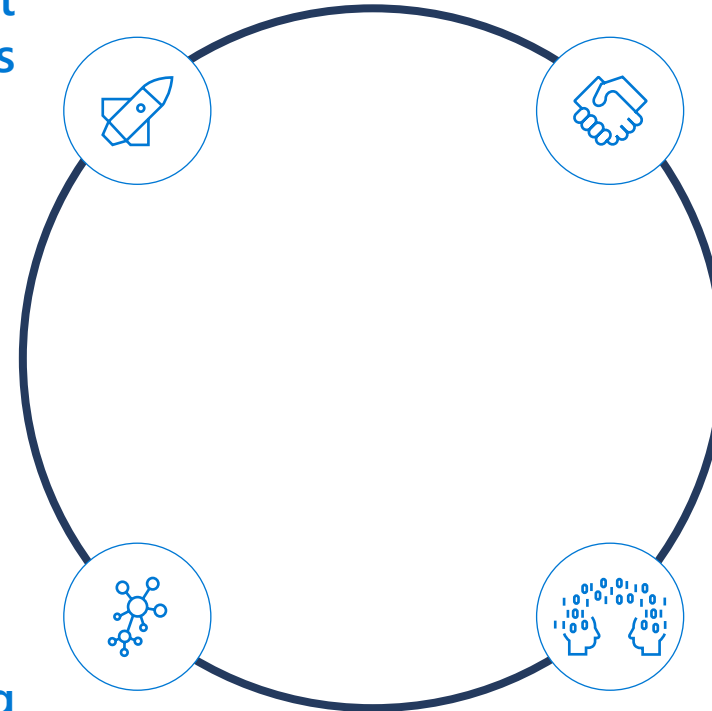
Understanding  
Businesses



Modeling



Data Collection  
& Interpretation

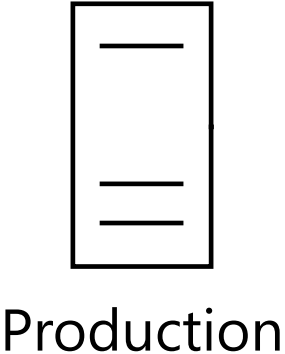
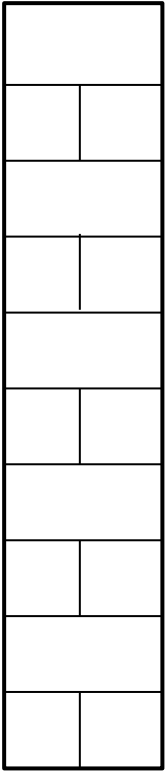
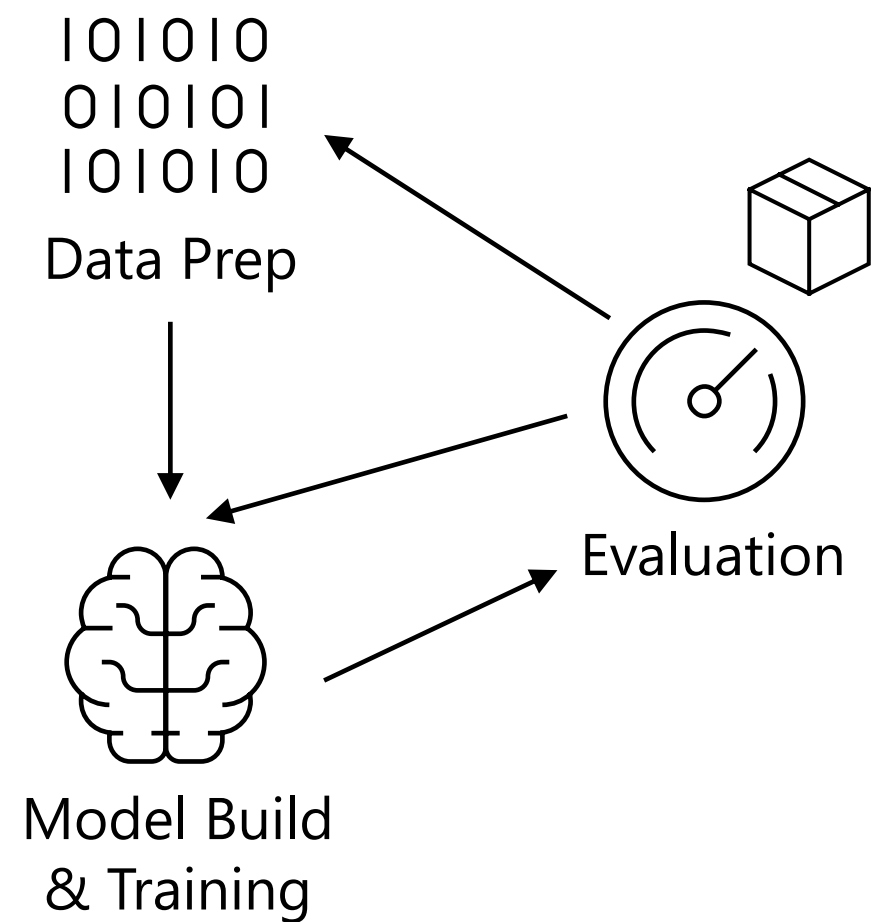






# MLOps with Responsible AI

# Machine Learning Process



DEVOPS	MLOPS
Manage code (source files)	Manage code (source files) Manage data files, notebooks, Rmd docs
Manage infrastructure (as code)	Manage infrastructure (as code) Manage environments (as code)
Source code control	Source code control Track experiment outcomes Manage data sets
Build executables Builds take hours (mostly) commodity compute	Train models Model training may take weeks or months GPU compute
Manage build versions	Manage model versions Manage reproducible environments
Tests (deterministic) Fix bugs with code	Tests (probabilistic) Fix bugs with code and/or data Model drift / model retraining

# Considering Responsible AI with Azure Machine Learning Service & GitHub Actions

Set of Azure  
Cloud Services



Python & R  
SDKs



GitHub  
Actions

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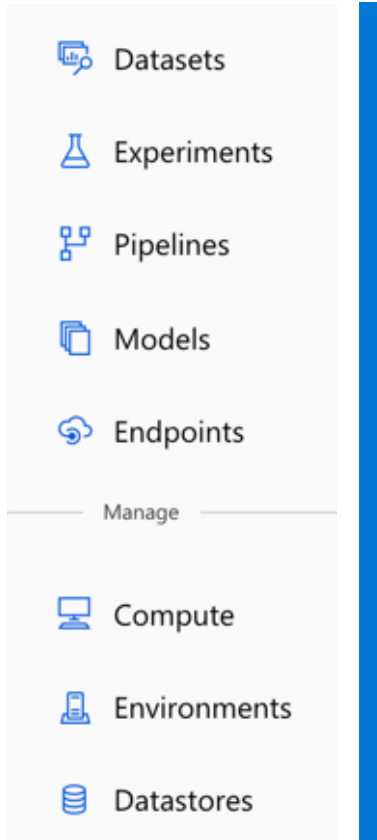
That enables  
you to:

- ✓ Prepare Data
- ✓ Build Models
- ✓ Train Models

- ✓ Manage Models
- ✓ Track Experiments
- ✓ Deploy Models

- ✓ Manage Code
- ✓ Collaborate
- ✓ Continuous Integration

# Azure Machine Learning and MLOps



**Datasets** – registered, known data sets

**Experiments** – executing trainings

**Pipelines** – workflows for trainings

**Models** – registered models (version management)

**Endpoints** – model endpoints for deployed models

**Compute** – (CPU/GPU) computing resources management

**Environments** – environment mgmt. for training & inferences

**Datastores** – connection to data stores



# Quick Demo: Fairlearn open source and MLOps

## Azure Machine Learning with Fairlearn open source

How can we guarantee that artificial intelligence (AI) has fairness? Even though someone designs a system with great machine learning algorithms and data with good purposes, AI may show unintended & unfair results such as gender, cultural, and ethnic bias.

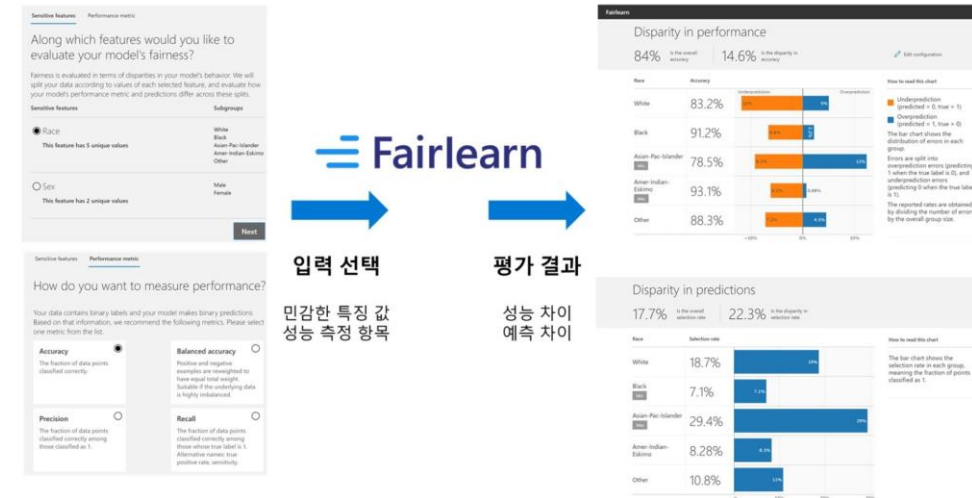


## Evaluating your machine learning model with Fairlearn open source

Fairlearn is an open source toolkit to assess and improve the fairness of machine learning models which is written with Python and available at [GitHub](#). You can start using `pip` command in your local environment or even your cloud like Azure. Let's see how to assess your machine learning model. First, you need to install Fairlearn library.

```
pip install fairlearn
```

Generally, machine learning models are made by defining models, training with data, and predicting with test data sets. To evaluate machine learning models, typical metrics are like accuracy, precision, recall, AUC, MAE, and RMSE considering machine learning algorithm types like classification, regression, or clustering ([Microsoft Docs](#) is a great reference). Fairlearn library has functions to assess fairness based on such metrics, and to see disparity in performance and predictions. Dashboard is a really cool to see results on Jupyter notebooks.



From now, let's see how to use Fairlearn with one [OpenML census dataset](#). `fetch_openml()` function on [Scikit-learn](#) is an easy way to retrieve such dataset by passing dataset unique number as 1590. The goal of designing a machine learning model in this scenario is to predict whether someone exceeds annual salary more than 50K or not. Note that it is a best practice to drop sensitive features like sex and races before training the model with a dataset.

GitHub article: <https://aka.ms/fairlearn-and-mlops-en>



Please think your AI  
with total ethical  
consideration

“Thank you”



Enable people

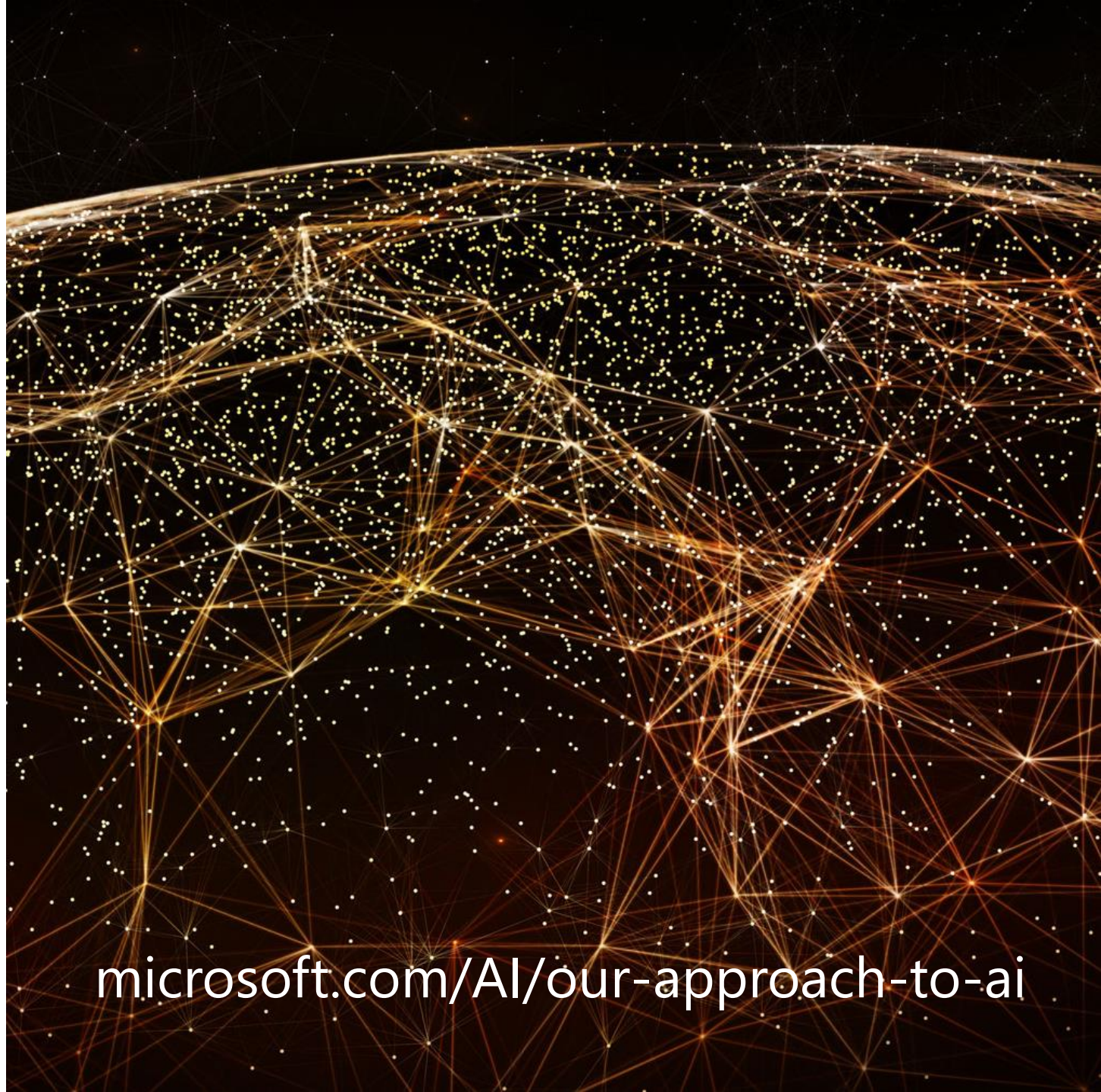


Inclusive



Fair and Transparent

[microsoft.com/AI/our-approach-to-ai](https://microsoft.com/AI/our-approach-to-ai)





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