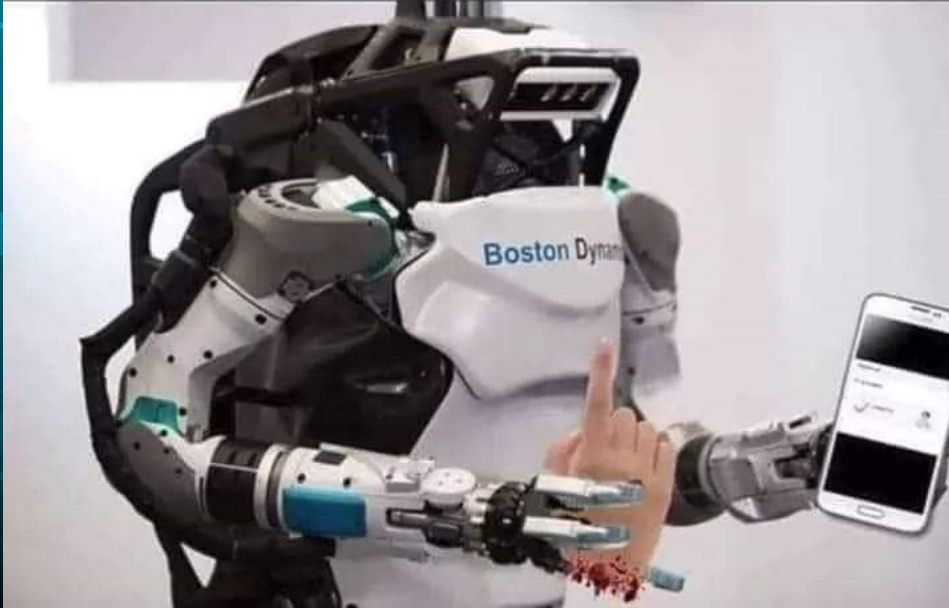


Don't want to

[illegible]



Session will start at
10:00 CST / 16:00 UTC

 A Lunar Cat production...



From the producer of...

SQL Curiosities

Curiosity killed the kitten



Upgrade Your Grey Cells
and use
Azure Synapse Analytics

Andre Melancia
PDC Conf
2021-09-16

GET SMART WITH CHAOS:
AN AZURE STORY

ANDRE MELANCIA
GLOBAL AZURE BULGARIA
2022-05-14

2021,
An Azure Bot Odyssey

Andre Melancia
MCT Summit - Frankfurt 2021
2021-09-26

The Big Quantum Theory
An Azure Story



Hacking SQL Server
Is Not Enough

Coming soon to a conference near you...

Andre Melancia's

Murder on
the
Motherboard
Express



COLLABORATION
GOVERNANCE
2020-12-04

How To Be A Human Being - For Beginners



by
Andre Melancia

2020-07-04 19:01 UTC
Message from: ?
"Machine Learning is full of st..."
An Azure Story

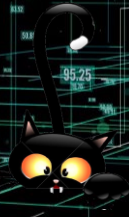


Featuring
Andre Melancia

The Knights
of the
Round Graph



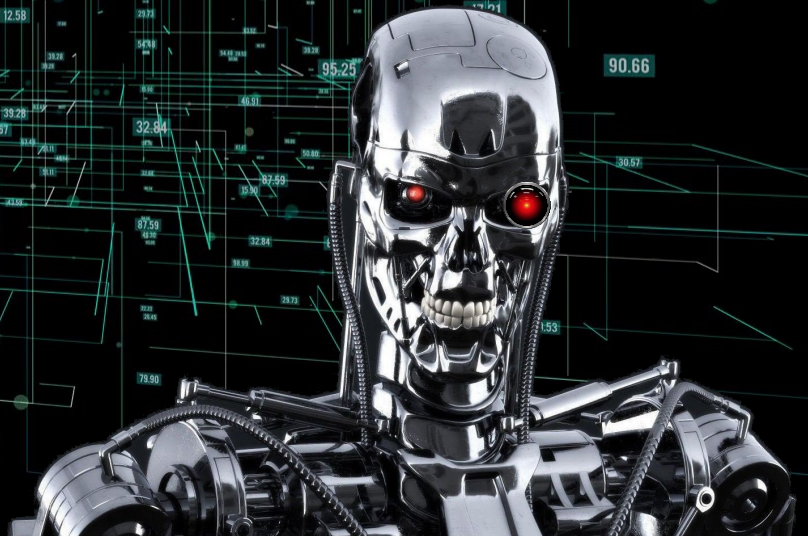
Machines Are Learning. You Should Learn ML Too: An Azure Story



Andre' Melancia

SQL Saturday #1028 Minnesota

2022-12-03



3 December

International Day of Persons with Disabilities



take action disability-inclusion
women with disabilities understanding disability mobilize action
promote dignity plan events mainstream disability
organize forums ensure equality
develop social policies employment inclusive education
social integration advocate human rights
children with disabilities **empowerment**
accessible healthcare
data collection awareness-raising
end stigma and stereotyping

Accessible



United Nations

Be informed! Get involved!

www.un.org/disabilities

enable@un.org





Questions?

ONE DOES NOT SIMPLY



UNPLUG SKYNET



Types of Algorithms

- ➔ Supervised (YOU provide the result)
 - ➔ Linear regression
 - ➔ Classification
- ➔ Unsupervised (YOU don't provide the result)
 - ➔ Clustering
 - ➔ Imaging (e.g. Neural networks)



Advanced bovine statistics





Regression Algorithms

➔ Learn by finding a linear pattern in data

➔ https://en.wikipedia.org/wiki/Linear_regression

➔ Predict numeric values
(linear or not)

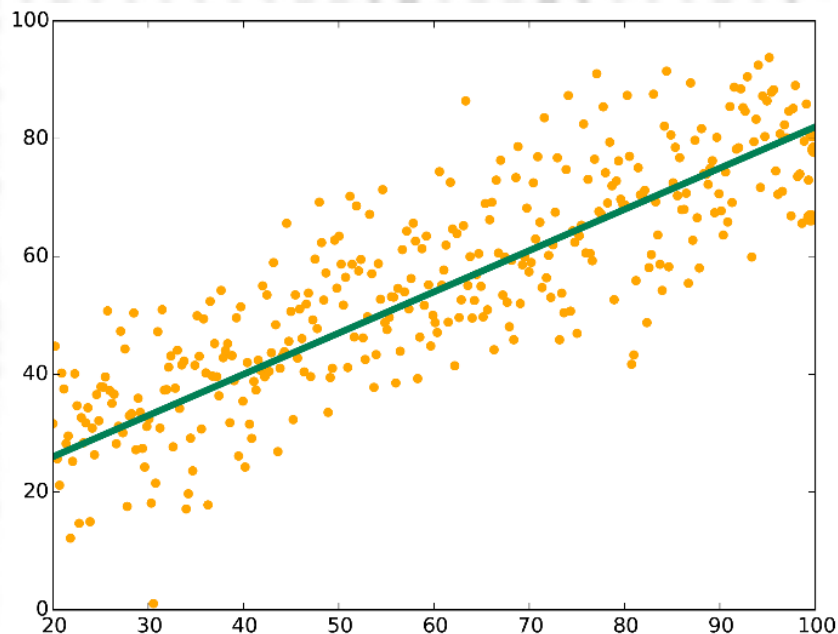
➔ Trends

➔ Weather

➔ Economics

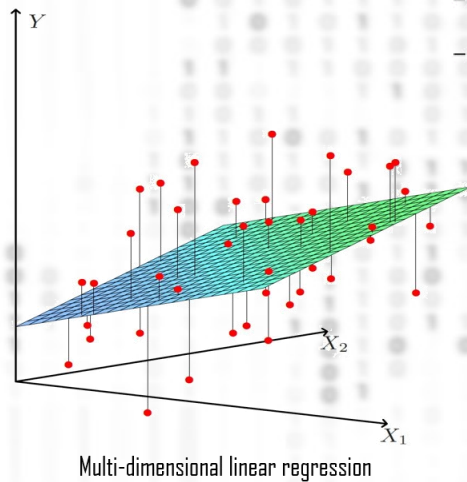
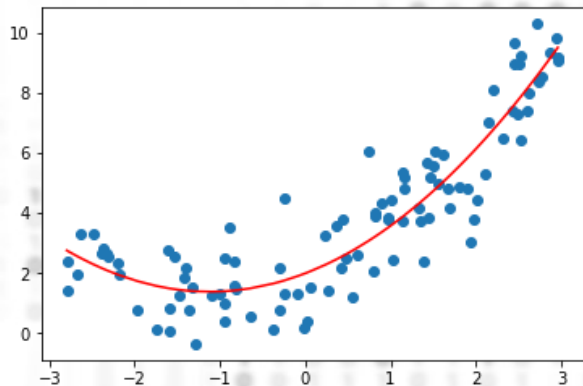
➔ Biology

➔ [...]



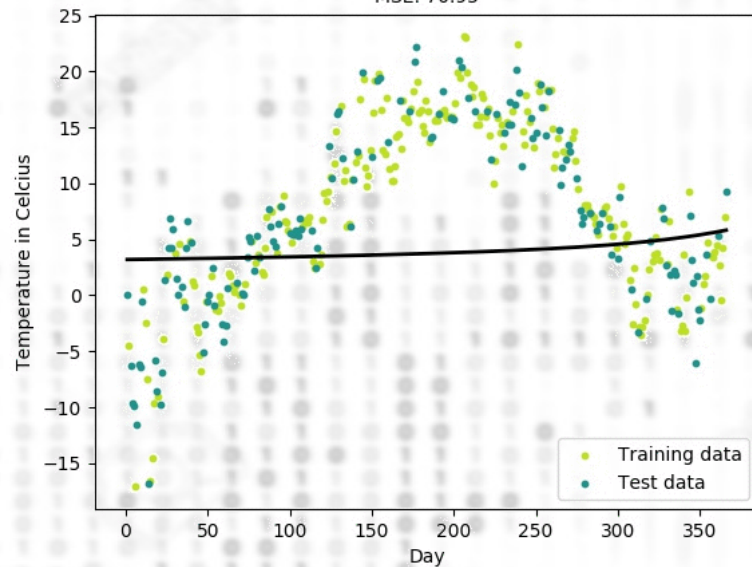


Algorithm: Regression



Polynomial Ridge Regression

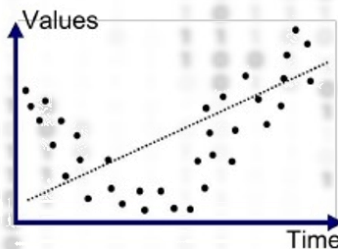
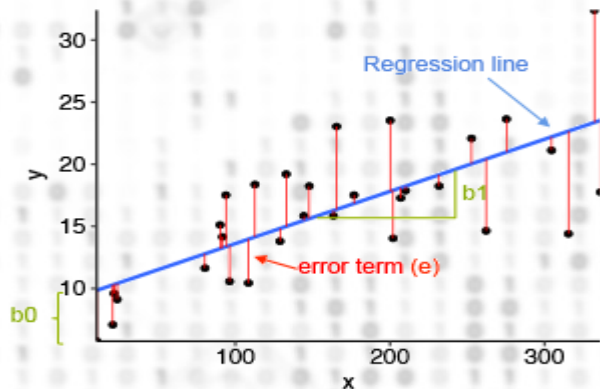
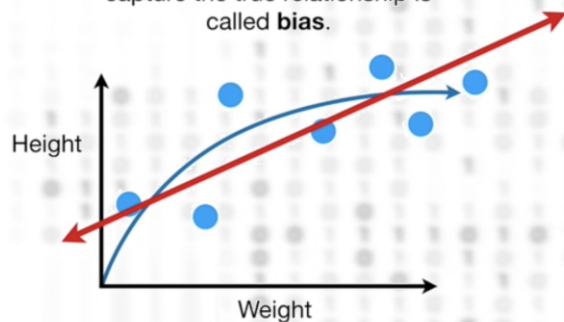
MSE: 70.95



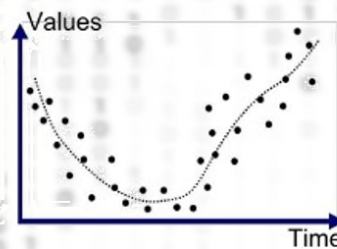


Algorithm: Regression

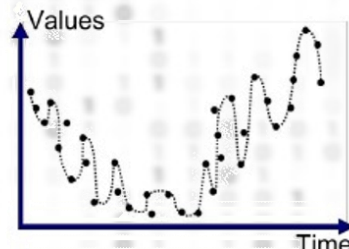
The inability for a machine learning method (like linear regression) to capture the true relationship is called **bias**.



Underfitted



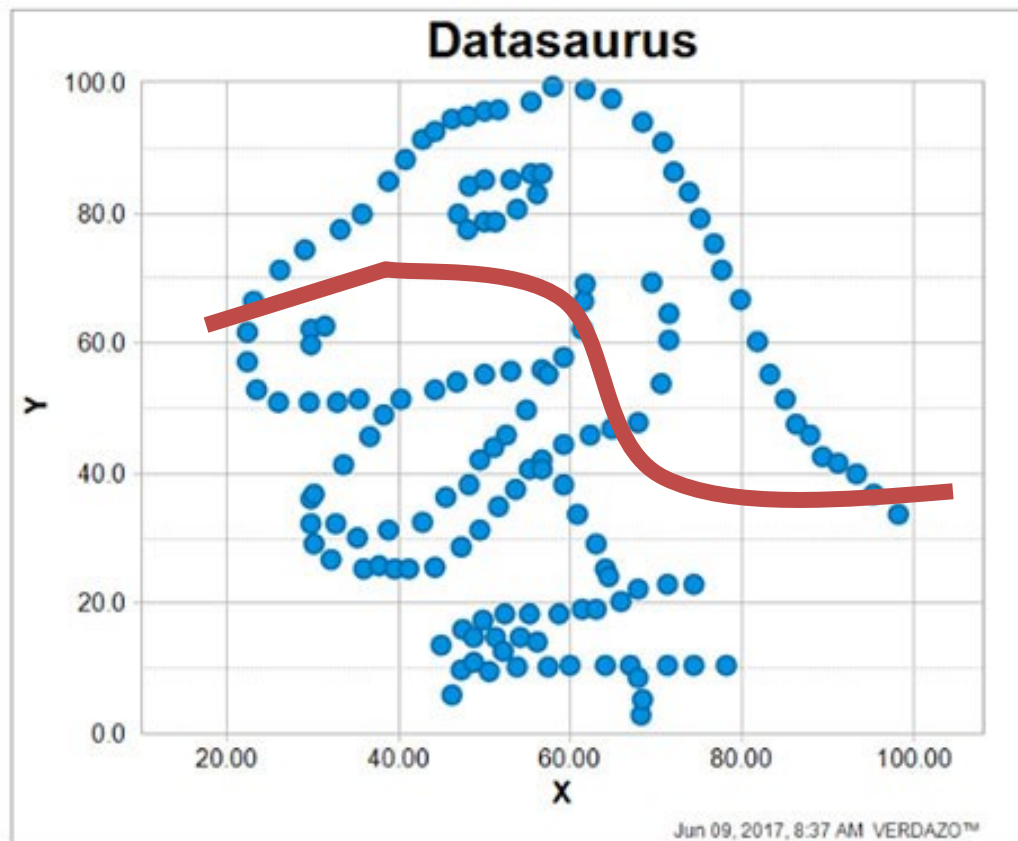
Good Fit/Robust



Overfitted



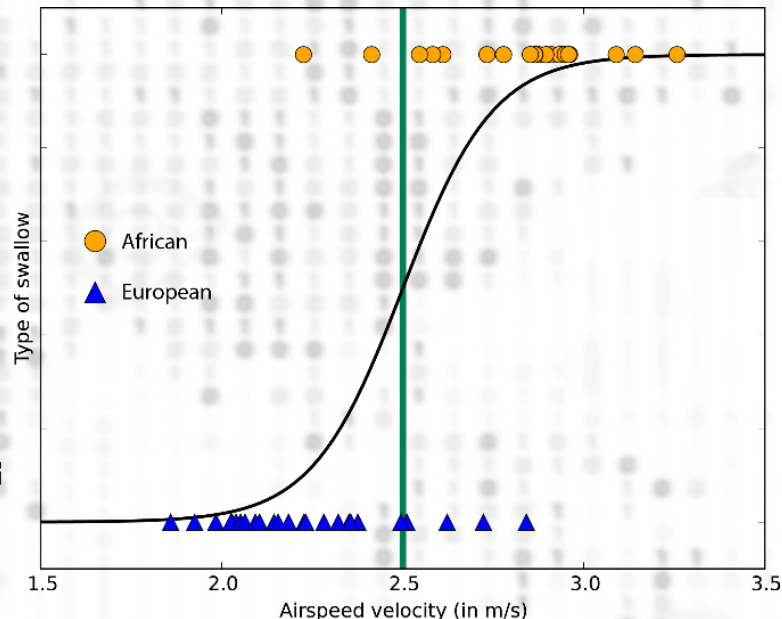
Beware of the statistics monsters...





Classification Algorithms

- ➔ Classify in 2-class or multi-class models
- ➔ Logistic Regression (2 class)
 - ➔ https://en.wikipedia.org/wiki/Logistic_regression
 - ➔ Learn by finding a binary pattern in data
 - ➔ Either the positive or the negative (or A and B)
 - ➔ Returns a numeric value (e.g. percentage, where 0% is most likely false and 100% is most likely true)

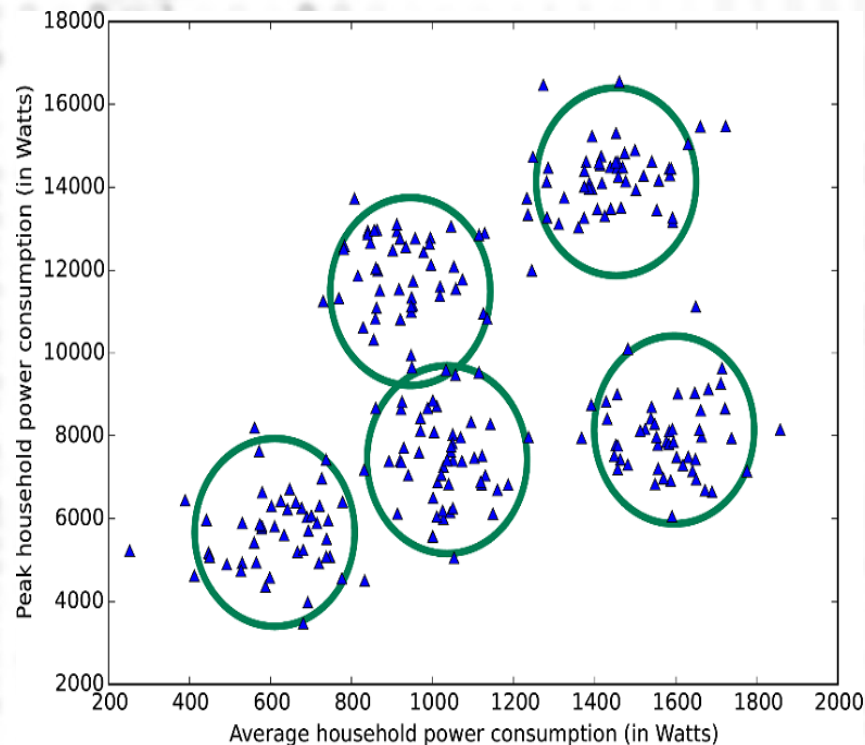




Clustering Algorithm

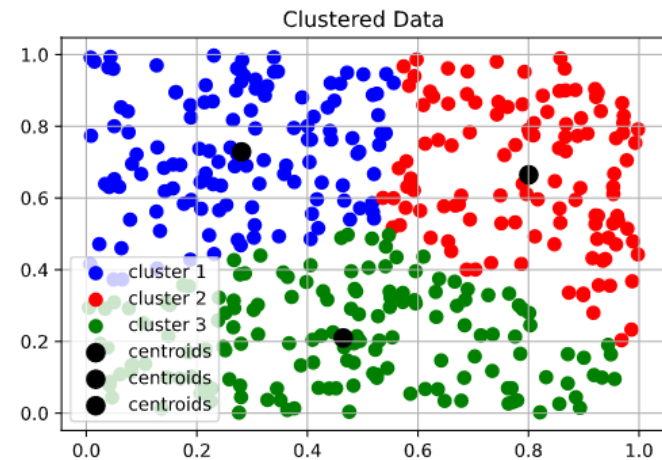
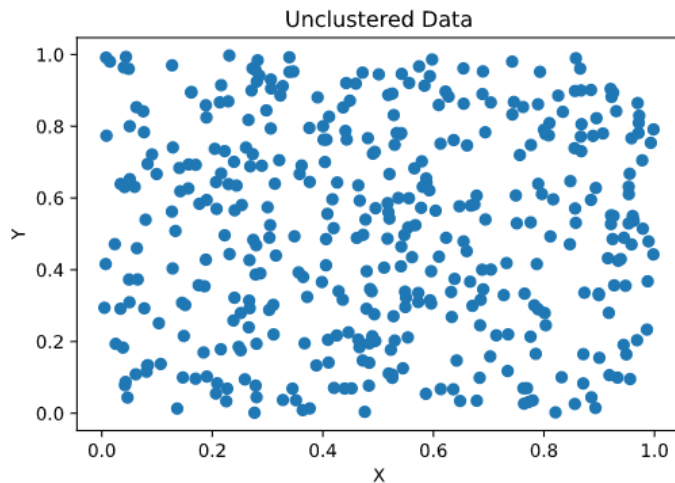
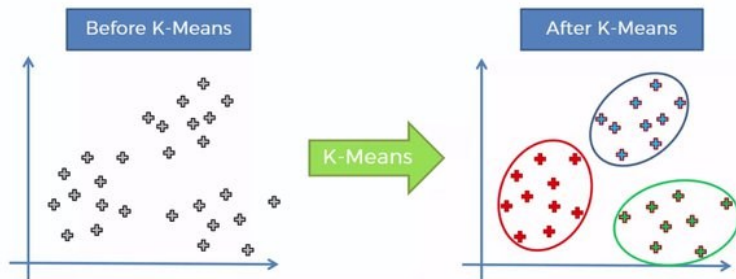
- ➞ Multiple algorithms for clustering
- ➞ k-means, etc.
 - ➞ Find grouping patterns in data
 - ➞ Shopping trends
 - ➞ Social network analysis
 - ➞ Crime analysis (fraud detection)

➞ https://en.wikipedia.org/wiki/H-means_clustering



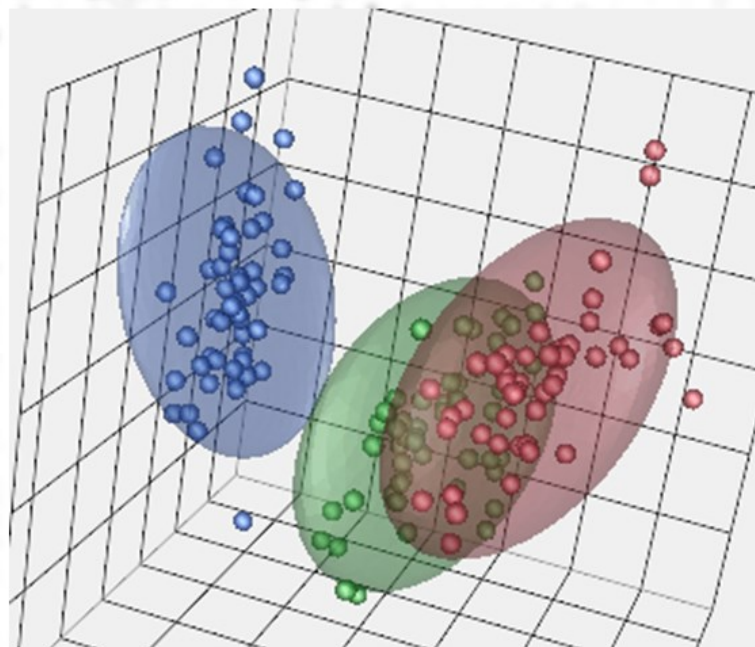
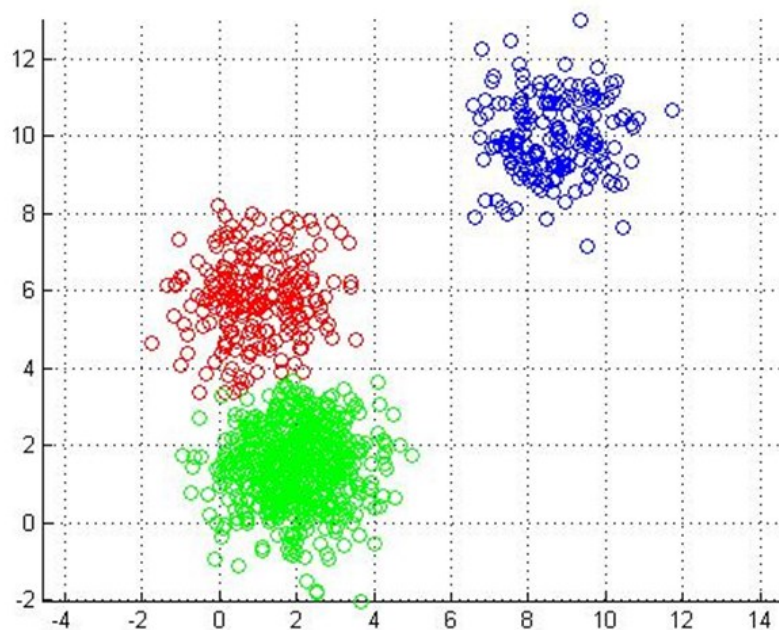


Clustering with h-means





Algorithm: Clustering in N-dimensions

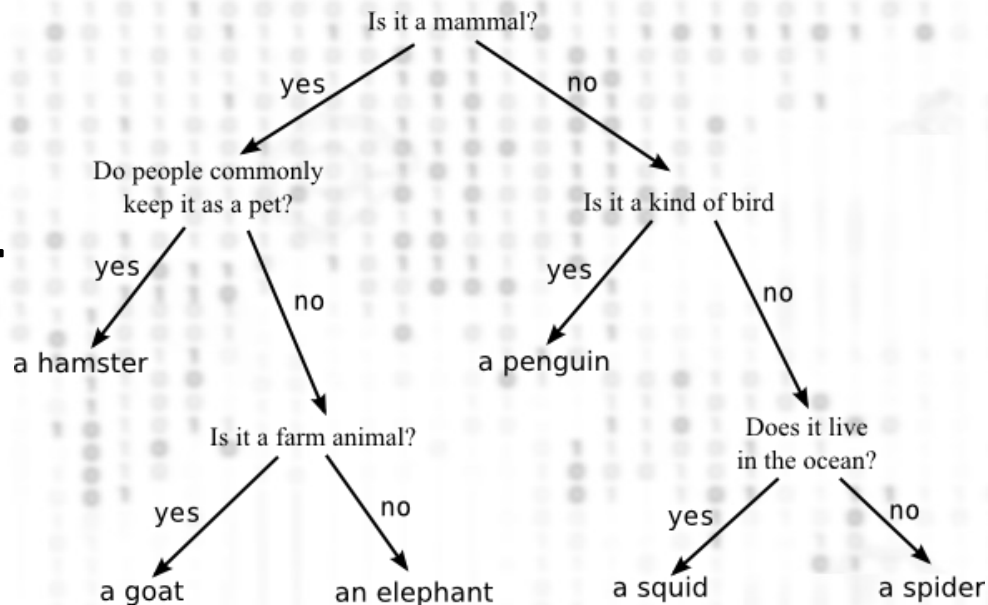


Explanation + code : <https://stanford.edu/~cpiech/cs221/handouts/kmeans.html>



Algorithm techniques: Decision tree

- E.g. Multi-class model
- Both for numerical and categorical data.
- Conditions explained by simple Boolean logic.
- Easy to expand the tree if more detail is needed
- https://en.wikipedia.org/wiki/Decision_tree_learning





Decision tree in the wild (since the 1990s)

→ <http://20Q.NET>

Q3. Will it eat almost anything?

Yes , No , Unknown, Irrelevant, Sometimes, Maybe, Probably, Doubtful, Usually, Depends, Rarely, Partly

2. Can it scratch? **Yes.**

1. It is classified as **Animal**.



Play 20Q

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Like

Share

"The 20Q is so good at guessing, it's almost scary."
Stephen Cass
"IEEE Spectrum",

Q20. I am guessing that it is a kitty cat?
Right, Wrong, Close

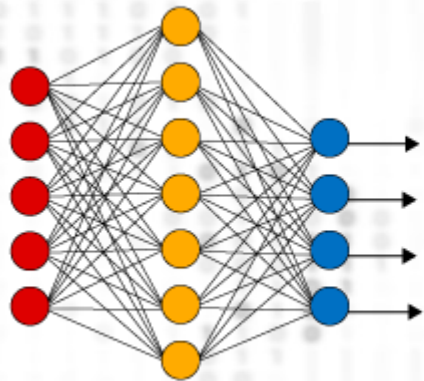
19. Is it striped? **Sometimes.**
18. Is it brown? **Sometimes.**
17. Is it colourful? **Sometimes.**
16. Can it climb? **Yes.**
15. Can it growl? **Yes.**
14. Is it considered valuable? **Irrelevant.**
13. Would you give it as a gift? **Yes.**
12. Is it black? **Sometimes.**
11. Does it live in a burrow? **No.**
10. Does it dig holes? **Rarely.**
9. Is it killed for its fur? **No.**
8. Is it white? **Sometimes.**
7. Does it eat cheese? **No.**
6. Is it used with animals? **Irrelevant.**
5. Can you see it in a zoo? **Doubtful.**
4. Is it a wild animal? **Sometimes.**
3. Does it have teeth? **Yes.**
2. Is it small? **Yes.**
1. It is classified as **Animal.**



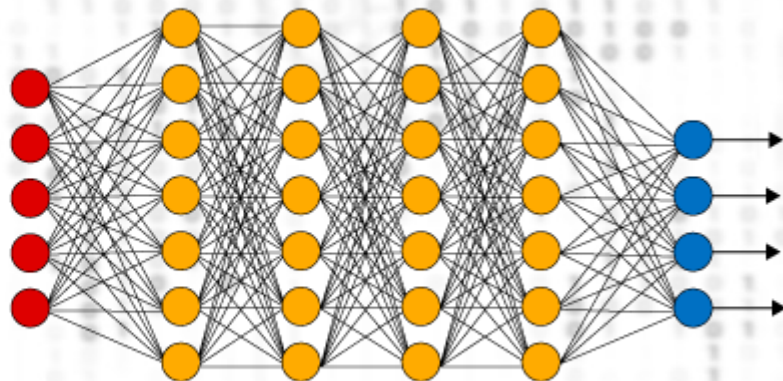
Algorithm techniques: Neural Networks

- E.g. Imaging, Deep Learning
- Slowest but most accurate
- https://en.wikipedia.org/wiki/Artificial_neural_network
- https://en.wikipedia.org/wiki/Deep_learning

Simple Neural Network



Deep Learning Neural Network



Input Layer



Hidden Layer



Output Layer



Not all
“Data Science”
is
Data Science...

For all of you naturally skeptical science lovers:
Does this qualify as a sandwich?

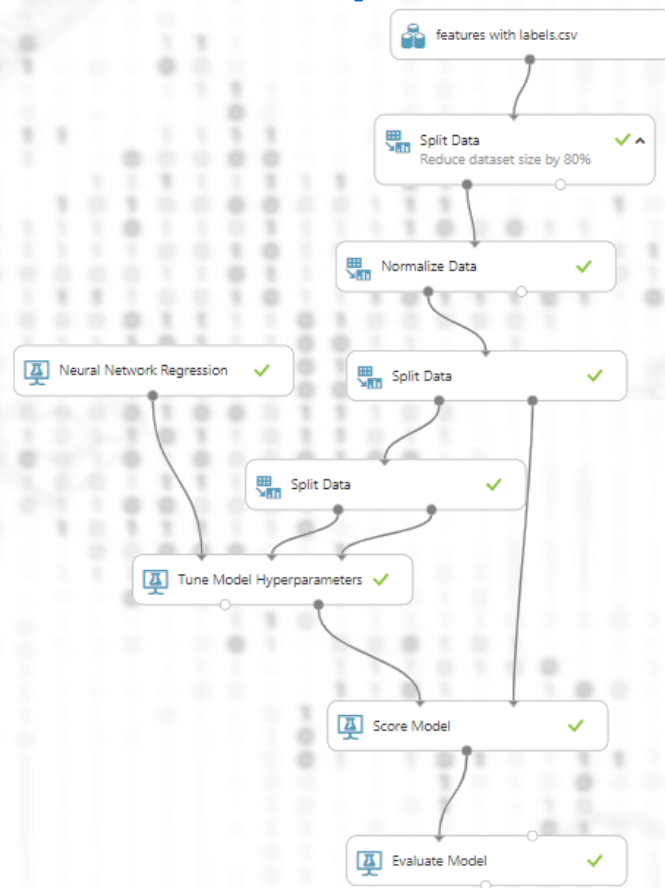


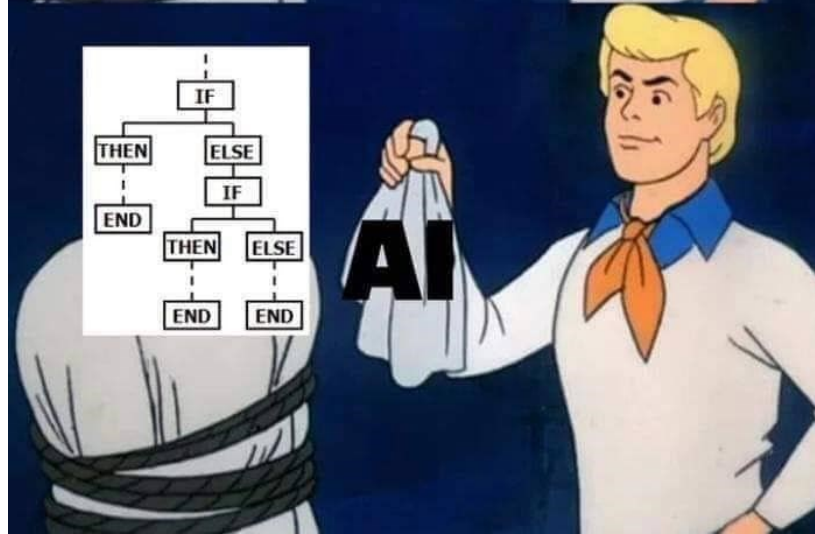


I was told workflow was here. Could I see it, please?

Machine Learning typical workflow:

1. Get datasets
2. Clean, prep, feature engineering
3. Training (Choosing Algorithm and Hyper-Parameters)
 - Regression, Classification (2-class, multi-class), Clustering, Anomaly Detection, etc.
 - Deep Learning, Neural Networks, etc.
4. Scoring/Testing
5. Evaluating
6. Deploying predictive webservices (inference)
7. I'll retrain back!

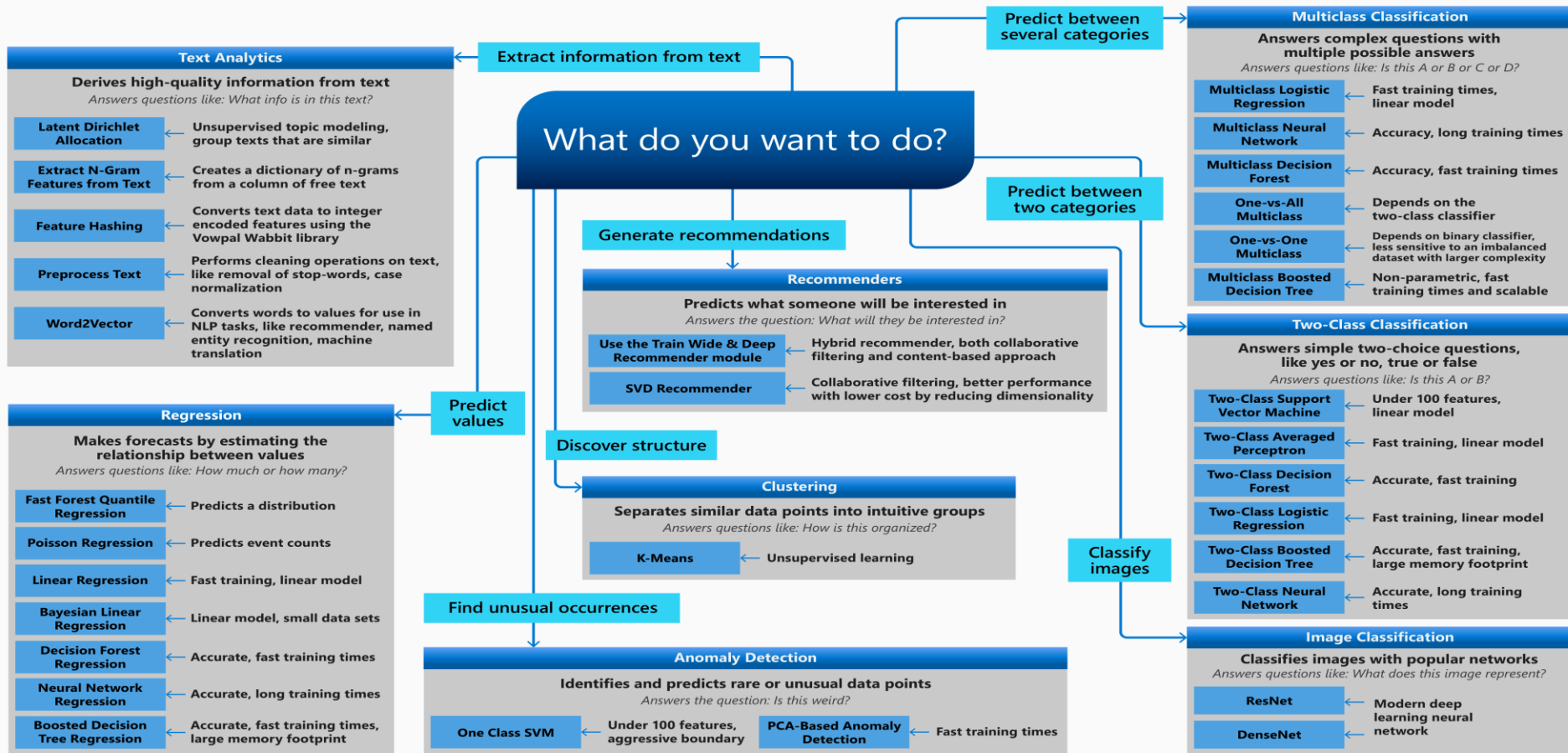






Machine Learning Algorithm Cheat Sheet

This cheat sheet helps you choose the best machine learning algorithm for your predictive analytics solution. Your decision is driven by both the nature of your data and the goal you want to achieve with your data.





Humans...

Using Machine Learning in the Microsoft
Universe doesn't require Data Science
background!

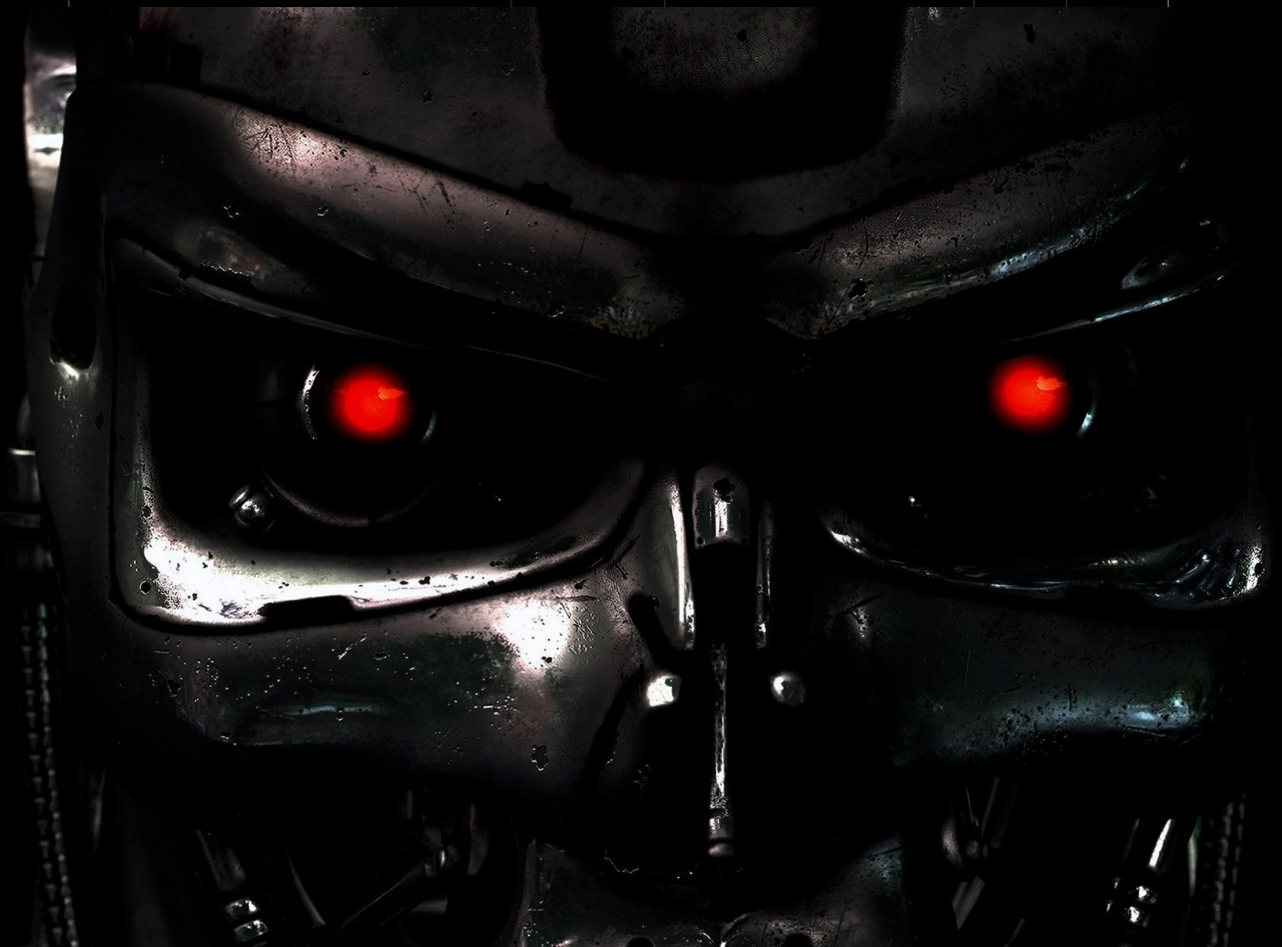
Anyone can do it!



"This is the world now. Logged on, plugged in, all the time."

1. Azure Machine Learning (Service / Workspace, not "Classic")
 - SDK Includes a lot of stuff (AutoML, HyperDrive, Model registry, SDK support for webservices in containers, etc.) – Supports Python, R (incomplete), MLFlow, etc.
 2. Azure Databricks (Spark clusters, SQL, Python, R, Scala)
 3. Azure HDInsight Spark
 4. Azure HDInsight R Server
 5. Azure Synapse Analytics (with SQL or Spark – SQL, Python, R, Scala, .Net)
 6. SQL Server 2016 (SQL, .Net or R Services)
 7. SQL Server 2017/2019/2022 (SQL, .Net, ML Services using R or Python)
 8. Any platform with .Net Core and libraries for ML.Net
 9. Azure Cognitive Services + Bots (managed webservices) + M365 Power Virtual Agents
 10. Etc...
- ❑ Some of these include their own notebooks (Jupyter, Zeppelin, DBC, etc.)
and you can use your tools like Azure Data Studio, Visual Studio Code, etc.

Magic is in the libraries,
not the languages!



"Come with me if you want to DEMO..."



Bad demo? Here's screenshots!

Microsoft Azure Machine Learning Studio

Search within your workspace (preview) This workspace

AndyAD > AndyML > Designer > Authoring

Designer built-in components using Python 3.6 have been upgraded to Python 3.8. This may impact your component outputs and/or endpoint deployments from inference pipelines. [Learn more](#)

Undo Redo Validate Show lineage Clone AutoSave

Census_2Class

Search by name, tags and description

Tags: All Add filter

Data Component

95

- Sample data (16)
- Data Transformation (19)
- Computer Vision (6)
- Model Scoring & Evaluation (6)
- Machine Learning Algorithms (29)
- Text Analytics (7)
- Python Language (2)
- Data Input and Output (3)
- Recommendation (5)
- R Language (1)
- Feature Selection (2)
- Anomaly Detection (2)

Adult Census Income Binary Classificatio...

Two-Class Boosted Decision Tree
two_class_boosted_decision_tree

Parameters

Train Model
train_model

Score Model
score_model

Evaluate Model
evaluate_model

Untrained model

Trained model

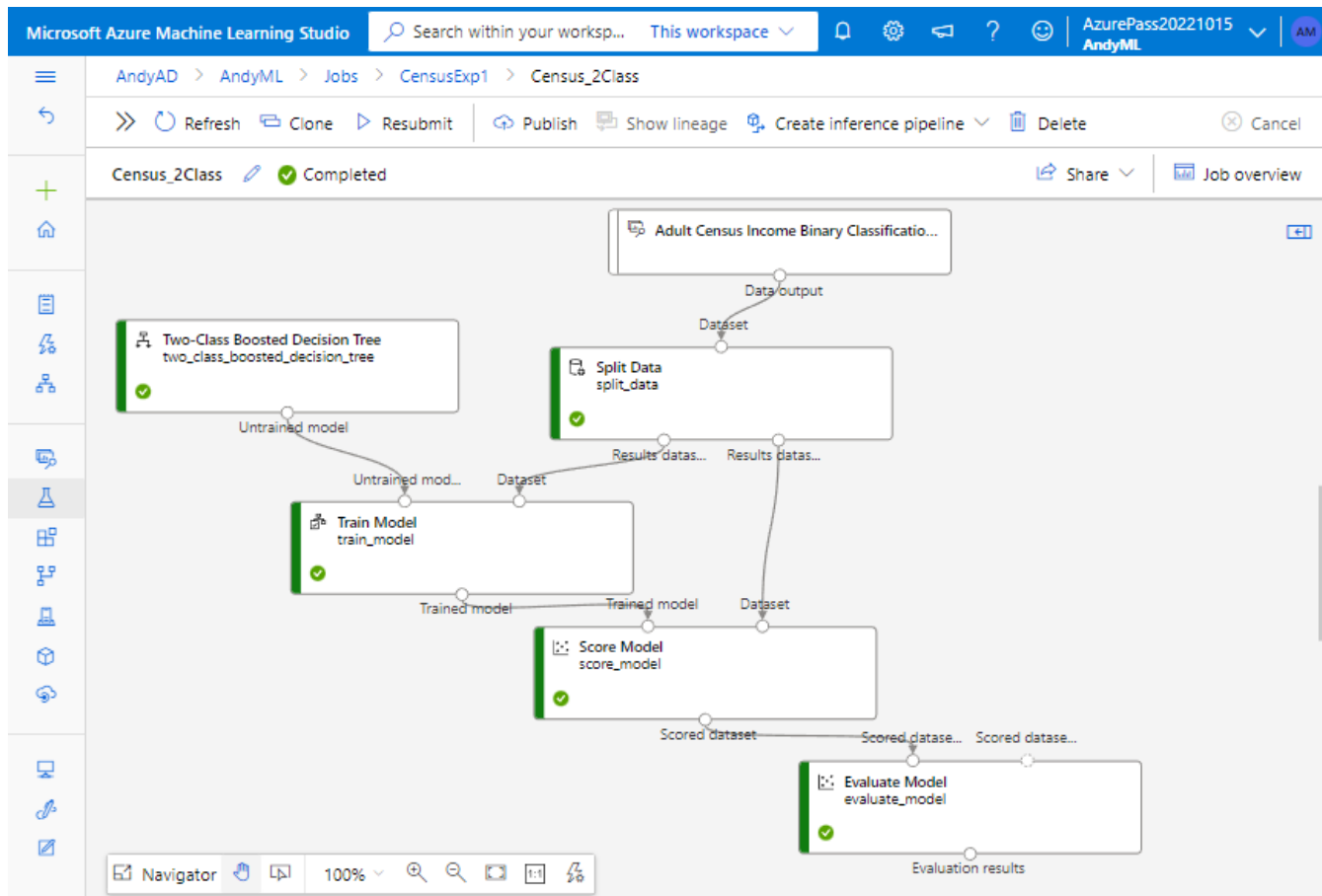
Scored dataset

Evaluation results

Navigator 100%

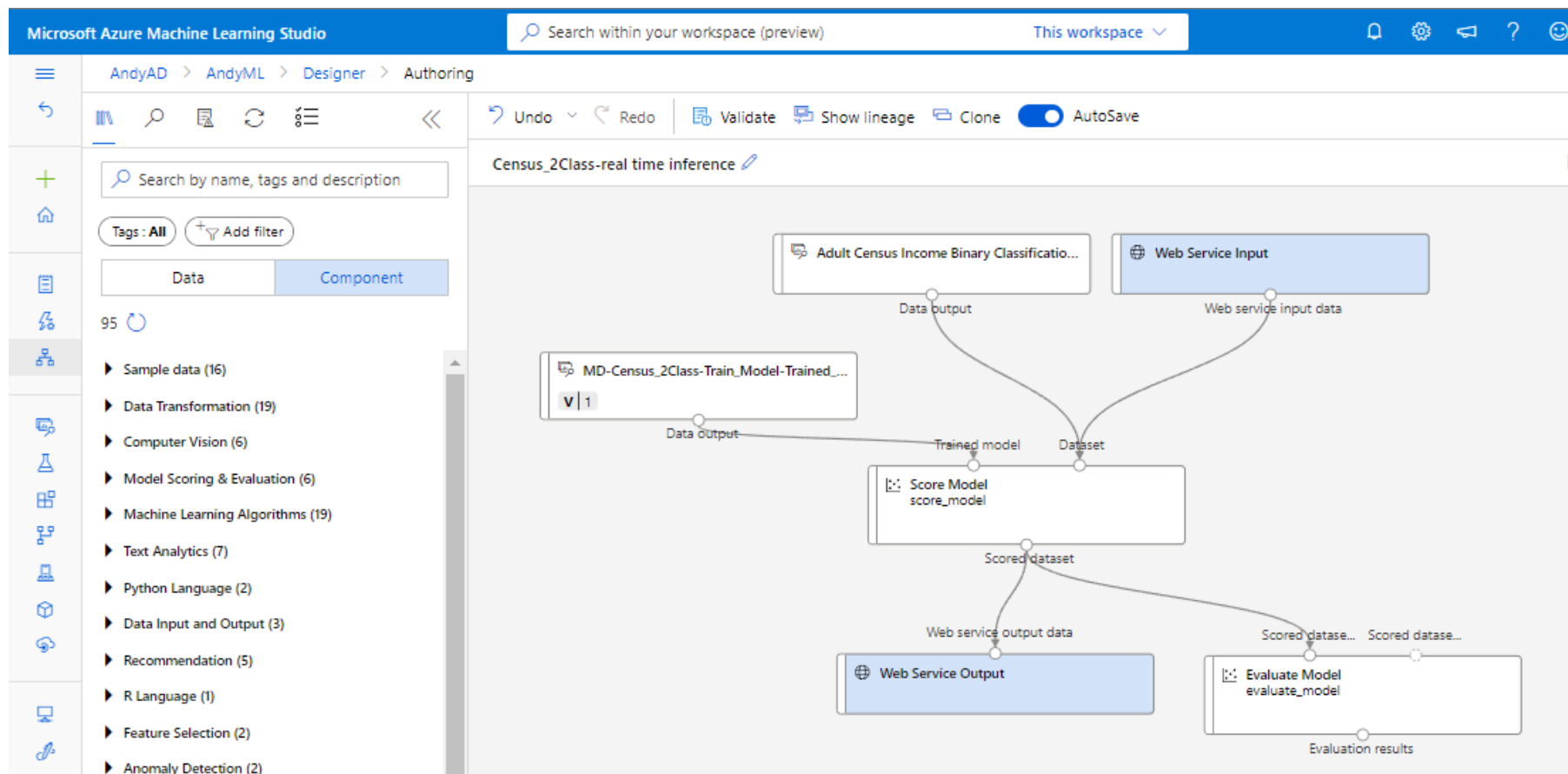


Bad demo? Here's screenshots!



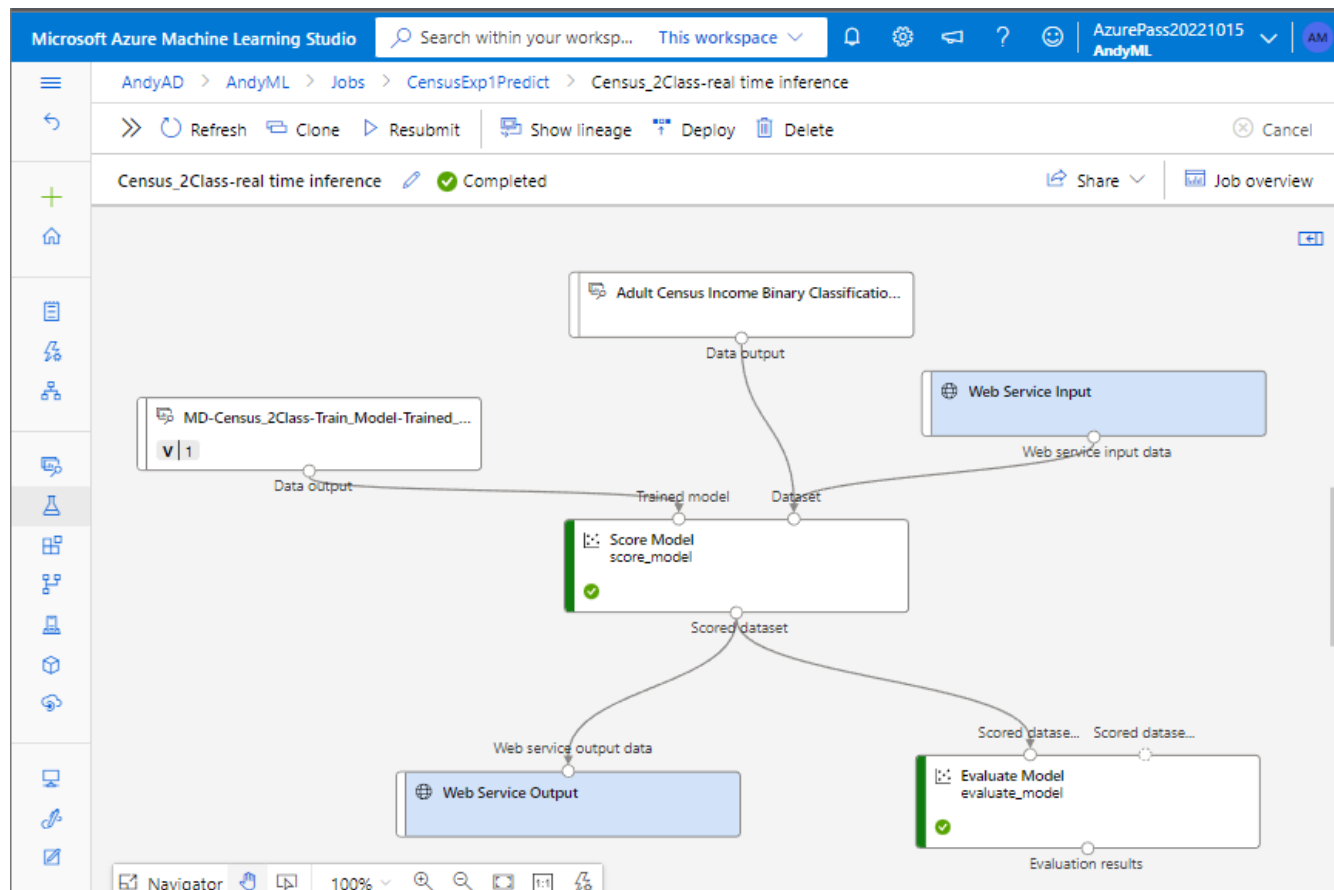


Bad demo? Here's screenshots!





Bad demo? Here's screenshots!





Bad demo? Here's screenshots!

Microsoft Azure Machine Learning Studio

Search within your workspace... This workspace

AzurePass20221015 AndyML

AndyAD > AndyML > Models

Model List

+ Register Refresh Delete Archive Deploy Compare (preview) Edit columns Reset view

Search Created on Created by Tags All filters Clear all

Showing 1-3 of 3 models Page size: 25

Name	☆	Version	Experiment	Job (Run ID)	Cre
amlstudio-censusexp1predictweb		1	CensusExp1Predict	93b31d27-7946-457d-b054-51...	19
sklearn_mnist		2			16
sklearn_mnist		1	Tutorial-sklearn-mnist	Tutorial-sklearn-mnist_1665908...	16



Bad demo? Here's screenshots!

Microsoft Azure Machine Learning Studio

Search within your workspace... This workspace

AndyAD > AndyML > Models > amlstudio-censusexp1predictweb:1

amlstudio-censusexp1predictweb:1

Details Versions Artifacts Endpoints Jobs Data Responsible AI Explanations (preview) Fairness (preview)

Refresh Archive Deploy Download all Share model

Attributes

Name
amlstudio-censusexp1predictweb

Version
1

Created on
19 Oct 2022 15:34

Created by
Andre' Melancia [AyAD]

Type
CUSTOM

Created by job
[93b31d27-7946-457d-b054-51a8b9b5a0d3](#)

Asset ID
azureml://locations/westeurope/workspaces/8875-9659-0447-4492-9551-6c45715b0061/models/amlstudio-censusexp1predictweb/versions/1

Tags

CreatedByAMLStudio : true

Properties

No properties

Description

Click edit icon to add a description





Bad demo? Here's screenshots!

Microsoft Azure Machine Learning Studio

Search within your workspace... This workspace

AndyAD > AndyML > Endpoints > censusexp1predictwebservice

censusexp1predictwebservice ☆

Details Test Consume Deployment logs

Attributes

Service ID
censusexp1predictwebservice

Description
--

Deployment state
Healthy ⓘ

Operation state
Succeeded

Compute type
Container instance

Created by
Andre' Melancia [AyAD]

Model ID
[amlstudio-censusexp1predictweb:1](#)

Created on
19 Oct 2022 15:34

Last updated on
19 Oct 2022 15:34

Image ID

Tags

CreatedByAMLStudio
true

Properties

[Real-time inference pipeline job](#)

[Training pipeline job](#)

hasInferenceSchema
True

hasHttps
False

authEnabled
True





Bad demo? Here's screenshots!

Microsoft Azure Machine Learning Studio

Search within your workspace (preview) This workspace

AndyAD > AndyML > Endpoints > censusexp1predictweb service

censusexp1predictweb service

Details Test Consume Deployment logs

Input data to test real-time endpoint Test

```
"Inputs": {
  "WebServiceInput0": [
    {
      "age": 39,
      "workclass": "State-gov",
      "fnlwgt": 77516,
      "education": "Bachelors",
      "education-num": 13,
      "marital-status": "Never-married",
      "occupation": "Adm-clerical",
      "relationship": "Not-in-family",
      "race": "White",
      "sex": "Male",
      "capital-gain": 2174,
      "capital-loss": 0,
      "hours-per-week": 40,
      "native-country": "United-States",
      "income": "<=50K"
    },
    {
      "age": 50,
      "workclass": "Self-emp-not-inc",
      "fnlwgt": 83311,
      "education": "Bachelors",
```

Test result

```
{
  "Results": {
    "WebServiceOutput0": [
      {
        "age": 39,
        "workclass": "State-gov",
        "fnlwgt": 77516,
        "education": "Bachelors",
        "education-num": 13,
        "marital-status": "Never-married",
        "occupation": "Adm-clerical",
        "relationship": "Not-in-family",
        "race": "White",
        "sex": "Male",
        "capital-gain": 2174,
        "capital-loss": 0,
        "hours-per-week": 40,
        "native-country": "United-States",
        "income": "<=50K",
        "Scored Labels": "<=50K",
        "Scored Probabilities": 0.01218772724540216
      },
      {
        "age": 50,
        "workclass": "Self-emp-not-inc",
        "fnlwgt": 83311,
```





Bad demo? Here's screenshots!

Microsoft Azure Machine Learning Studio

Search within your workspace (preview) This workspace ▾

AndyAD > AndyML > Endpoints > censusexp1predictweb service

censusexp1predictweb service ☆

Details Test Consume Deployment logs

Basic consumption info

REST endpoint
http://c4ca6b96-4205-4cb9-8d20-7ba430df2271.westeurope.azurecontainer.io/score

Authentication

Primary key
[Redacted] Regenerate

Secondary key
[Redacted] Regenerate

Consumption option

Consumption types

C#	Python	R
<pre>1 // This code requires the Nuget package Microsoft.AspNet.WebApi.Client to be installed. 2 // Instructions for doing this in Visual Studio: 3 // Tools -> Nuget Package Manager -> Package Manager Console 4</pre>		



Bad demo? Here's screenshots!

The screenshot shows the Visual Studio IDE with the following components:

- Menu Bar:** File, Edit, View, Git, Project, Build, Debug, Architecture, Test, Load Test, Analyze, Tools, Extensions, Window, Help.
- Toolbar:** Includes icons for undo, redo, save, and other standard development actions. The 'Debug' dropdown is set to 'Any CPU'.
- Solution Explorer:** Shows a solution named 'MyFirstMLProject' containing a single project 'MyFirstMLProject'. The project's 'Dependencies' and 'C# Program.cs' are visible.
- Code Editor:** Displays the file 'Program.cs' with the following code:

```
1 // This code requires the Nuget package Microsoft.AspNet.WebApi.Client to be installed.
2 // Instructions for doing this in Visual Studio:
3 // Tools -> Nuget Package Manager -> Package Manager Console
4 // Install-Package Newtonsoft.Json
5 // .NET Framework 4.7.1 or greater must be used
6
7 using System;
8 using System.Collections.Generic;
9 using System.IO;
10 using System.Net.Http;
11 using System.Net.Http.Headers;
12 using System.Text;
13 using System.Threading.Tasks;
14 using Newtonsoft.Json;
15
16 namespace CallRequestResponseService
17 {
18     0 references
19     class Program
20     {
21         0 references
22         static void Main(string[] args)
23         {
24             InvokeRequestResponseService().Wait();
25         }
26     }
27 }
```
- Status Bar:** Shows '100 %' zoom, 'No issues found', and a scrollbar.





Bad demo? Here's screenshots!

```
C:\ Select Microsoft Visual Studio Debug Console

Result: {"Results": {"WebServiceOutput0": [{"age": 39, "workclass": "State-gov", "fnlwgt": 77516, "education": "Bachelor's", "education-num": 13, "marital-status": "Never-married", "occupation": "Adm-clerical", "relationship": "Not-in-family", "race": "White", "sex": "Male", "capital-gain": 2174, "capital-loss": 0, "hours-per-week": 40, "native-country": "United-States", "income": "<=50K", "Scored Labels": "<=50K", "Scored Probabilities": 0.01218772724540216}, {"age": 50, "workclass": "Self-emp-not-inc", "fnlwgt": 83311, "education": "Bachelors", "education-num": 13, "marital-status": "Married-civ-spouse", "occupation": "Exec-managerial", "relationship": "Husband", "race": "White", "sex": "Male", "capital-gain": 0, "capital-loss": 0, "hours-per-week": 13, "native-country": "United-States", "income": "<=50K", "Scored Labels": "<=50K", "Scored Probabilities": 0.26952520043708017}, {"age": 38, "workclass": "Private", "fnlwgt": 215646, "education": "HS-grad", "education-num": 9, "marital-status": "Divorced", "occupation": "Handlers-cleaners", "relationship": "Not-in-family", "race": "White", "sex": "Male", "capital-gain": 0, "capital-loss": 0, "hours-per-week": 40, "native-country": "United-States", "income": "<=50K", "Scored Labels": "<=50K", "Scored Probabilities": 0.023948608105902526}, {"age": 53, "workclass": "Private", "fnlwgt": 234721, "education": "11th", "education-num": 7, "marital-status": "Married-civ-spouse", "occupation": "Handlers-cleaners", "relationship": "Husband", "race": "Black", "sex": "Male", "capital-gain": 0, "capital-loss": 0, "hours-per-week": 40, "native-country": "United-States", "income": "<=50K", "Scored Labels": "<=50K", "Scored Probabilities": 0.08759885505524728}, {"age": 28, "workclass": "Private", "fnlwgt": 338409, "education": "Bachelors", "education-num": 13, "marital-status": "Married-civ-spouse", "occupation": "Prof-specialty", "relationship": "Wife", "race": "Black", "sex": "Female", "capital-gain": 0, "capital-loss": 0, "hours-per-week": 40, "native-country": "Cuba", "income": "<=50K", "Scored Labels": ">50K", "Scored Probabilities": 0.5060704221829483}]}]}

THE END

C:\One\OneDrive - Lunar Cat\Z_Apresentacoes\20221112 - SQLSatBangladesh - MyFirstMLProject\Project\MyFirstMLProject\bin\Debug\net6.0\MyFirstMLProject.exe (process 38208) exited with code 0.
To automatically close the console when debugging stops, enable Tools->Options->Debugging->Automatically close the console when debugging stops.
Press any key to close this window . . .
```





Bad demo? Here's screenshots!

Microsoft Azure Machine Learning Studio

Search within your workspace... This workspace

AndyAD > AndyML > Endpoints > censusexp1predictweb service

censusexp1predictweb service

Details Test Consume Deployment logs

574	2022-11-12 06:25:25,329	studio.core	DEBUG	[0] = <DataTable
				"Dataset" (5 Rows, 17 Cols) at 0x00007F9F281C5D30>
575	2022-11-12 06:25:25,329	studio.core	INFO	ScoreModelModule.run - End with
				0.0573s elapsed.
576	2022-11-12 06:25:25,333	studio.core	INFO	Executing node 0: Score Model - End
				with 0.0733s elapsed.
577	2022-11-12 06:25:25,335	studio.core	INFO	Processing - End with 0.1447s elapsed.
578	2022-11-12 06:25:25,335	studio.core	INFO	Post-processing - Start:
579	2022-11-12 06:25:25,335	studio.core	INFO	Post-processing - End with 0.0000s
				elapsed.
580	2022-11-12 06:25:25,335	studio.core	INFO	Handling http request - End with 0.1456s
				elapsed.
581	2022-11-12 06:25:25,335	studio.azureml.designer.serving.dagengine.request_handler	DEBUG	Run:
				output data(raw) = {"Results": {"WebServiceOutput0": [{"age": 39, "workclass": "State-gov",
				"fnlwgt": 77516, "education": "Bachelors", "education-num": 13, "marital-status": "Never-married",
				"occupation": "Adm-clerical", "relationship": "Not-in-family", "race": "White", "sex": "Male",
				"capital-gain": 2174, "capital-loss": 0, "hours-per-week": 40, "native-country": "United-States",
				"income": "<=50K", "Scored Labels": "<=50K", "Scored Probabilities": 0.01218772724540216}, {"age": 13,
				50, "workclass": "Self-emp-not-inc", "fnlwgt": 83311, "education": "Bachelors", "education-num": 13,
				"marital-status": "Married-civ-spouse", "occupation": "Exec-managerial", "relationship": "Husband",
				"race": "White", "sex": "Male", "capital-gain": 0, "capital-loss": 0, "hours-per-week": 13,
				"native-country": "United-States", "income": "<=50K", "Scored Labels": "<=50K", "Scored
				Probabilities": 0.26952520043708017}, {"age": 38, "workclass": "Private", "fnlwgt": 215646,
				"education": "HS-grad", "education-num": 9, "marital-status": "Divorced", "occupation":
				"Handlers-cleaners", "relationship": "Not-in-family", "race": "White", "sex": "Male",
				"capital-gain": 0, "capital-loss": 0, "hours-per-week": 40, "native-country": "United-States",
				"income": "<=50K", "Scored Labels": "<=50K", "Scored Probabilities": 0.023948608105902526}, {"age":
				53, "workclass": "Private", "fnlwgt": 234721, "education": "11th", "education-num": 7





Questions?

ONE DOES NOT SIMPLY



UNPLUG SKYNET



"The unknown future rolls toward us.
I face it for the first time with a sense of
hope, because **if a machine, a Terminator,
can learn the value of human life,
maybe we can, too.**"

Thank you!

धन्यवाद

Obrigado, pá!

Благодаря!

Дуже дякую!

धन्यवाद

Tack så mycket!

¡Muchas gracias!

Vielen Danke!

Hvala vam!

ඔයාට ස්තූතියි

Ευχαριστώ!

Merci beaucoup!

Terima kasih!

Grazie mille!

Ďakujem!

Mulțumesc!

Labai ačiū!

Dziękuję Wam!

Mockrát děkuju!

Mange tak!

Kiitos!

Takk fyrir!

Dank u wel!

Takk!

Dank je!

Köszönöm!

Go raibh maith agaibh!

Diolch!



André Melancia



Andy.PT

LunarCat.PT

