NITE National Institute of Teaching and Education
part of the Coventry University Group

Coventry University | Group

An Introduction to Artificial Intelligence for Teachers

Prof. Matthew England
Coventry University

This webinar will begin shortly.

Introductions

Professor of Computer Science. Director of both our *Research Centre for Computational Science and Mathematical Modelling*, and our new ***AI Skills Academy***.



Course Director for our Level 4 CertHE Apprenticeship, *AI and Automation Practitioner*, in which I teach the module on Generative AI.

Session Aims



- Quick crash course on the current AI landscape: how modern LLMs work.
- Some examples of how AI may be used by teachers.
- References on where to go for more information (including our new AI and Automation Practitioner Apprenticeship course).

NITE National Institute of Teaching and Education
part of the Coventry University Group

Coventry University | Group

Introduction to AI and ML



Section 1

AI and ML



- **Artificial Intelligence (AI)** has a long history: for most of it, humans tried to write **Algorithmic AI**: detailed instructions for what an AI should do

AI and ML



- **Artificial Intelligence (AI)** has a long history: for most of it, humans tried to write **Algorithmic AI**: detailed instructions for what an AI should do.
- **Machine Learning** (ML): applies statistical techniques to build models from data that encode patterns, and generalise to unseen data *without explicit instructions*.

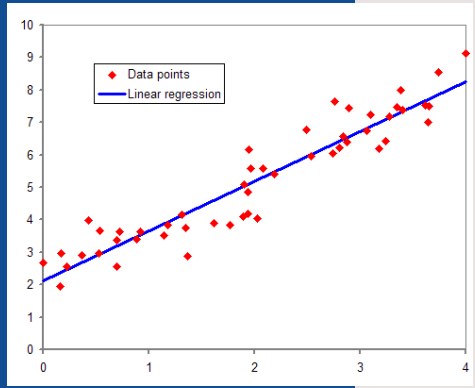
AI and ML

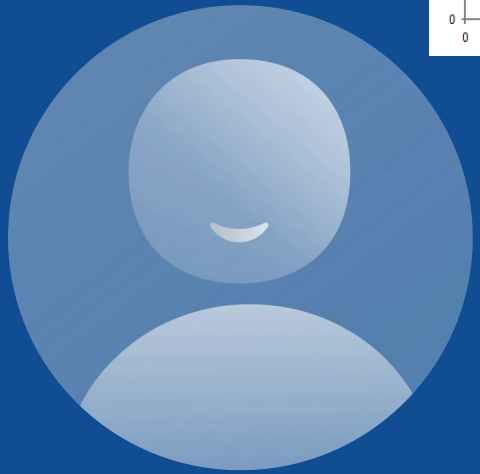


- **Artificial Intelligence (AI)** has a long history: for most of it, humans tried to write **Algorithmic AI**: detailed instructions for what an AI should do.
- **Machine Learning** (ML): applies statistical techniques to build models from data that encode patterns, and generalise to unseen data *without explicit instructions*.

ML overcomes the algorithmic AI bottleneck: the human writing the algorithm!

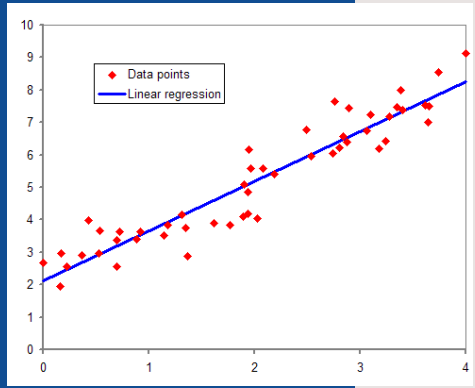
Different ML Models





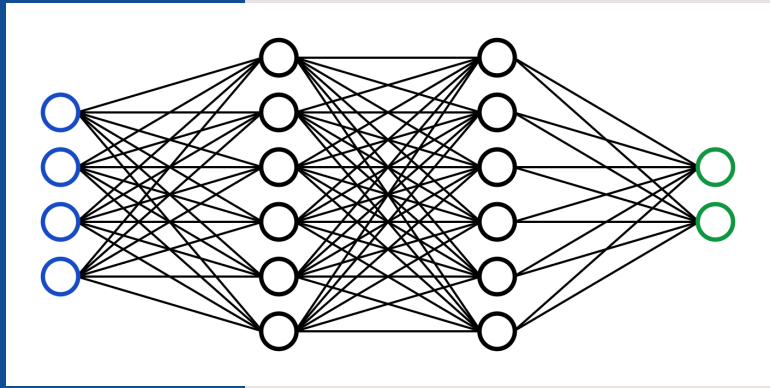
Linear Regression: fit a straight line to data to minimise sum of distances from points to line.

Different ML Models



Linear Regression: fit a straight line to data to minimise sum of distances from points to line.

Neural Network: data flows through network as numbers, affected by other numbers (network weights) which are updated each time to improve the output.



Machine Learning is not new



- ML is based on long-standing ideas of statistics.
- Neural Networks were proposed in the 50s and the main method to train them in the 80s.

Machine Learning is not new



- ML is based on long-standing ideas of statistics.
- Neural Networks were proposed in the 50s and the main method to train them in the 80s.
- ML has underpinned a lot of the technology of the last 20 years:
  - **Recommendation systems** are ML models trained on your purchase data.
  - **Autonomous driving systems** are ML models trained on driving data.
  - **Fraud detection systems** are ML models trained on your banking data.

Machine Learning is not new



However, generative models are a newer phenomenon

- ML is based on long standing ideas of statistics.
- Neural Networks were proposed in the 50s and the main method to train them in the 80s.
- ML has underpinned a lot of the technology of the last 20 years:
  - **Recommendation systems** are ML models trained on your purchase data.
  - **Autonomous driving systems** are ML models trained on driving data
  - **Fraud detection systems** are ML models trained on your banking data.

Analytical AI vs Generative AI



The media often conflates two different types of AI (both ML):

- **Analytical AI**: the creation of specialist ML models to undertake a single analytical task.
  - Usually created by the user.
  - Requires user to have dataset and compute.

Analytical AI vs Generative AI



The media often conflates two different types of AI (both ML):

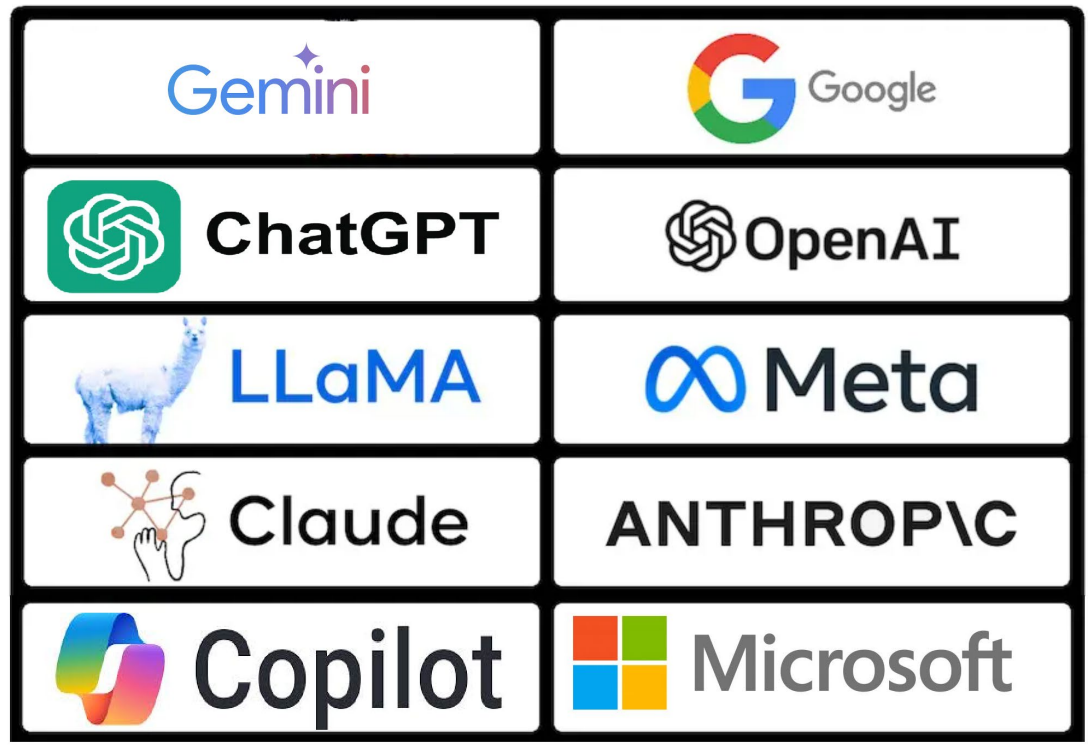
- **Analytical AI**: the creation of specialist ML models to undertake a single analytical task.
  - Usually created by the user.
  - Requires user to have dataset and compute.
- **Generative AI**: ML models trained to generate new content (text, images, code, etc.).
  - Usually created by a tech company and provided as a cloud service.
  - Requires user to pay for service.

Gen AI Frontier Model Quiz

	Google
	OpenAI
	Meta
	ANTHROP\C
	Microsoft



Gen AI Frontier Model Quiz





Questions so far?





NITE National Institute of Teaching and Education
part of the Coventry University Group

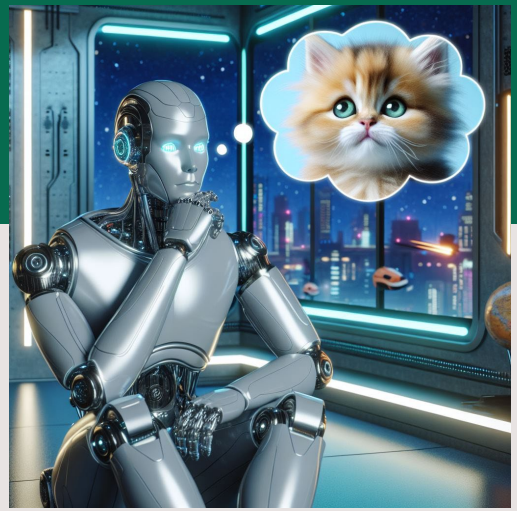
Coventry University | Group

How does an LLM work?



Section 2

Next Token Prediction

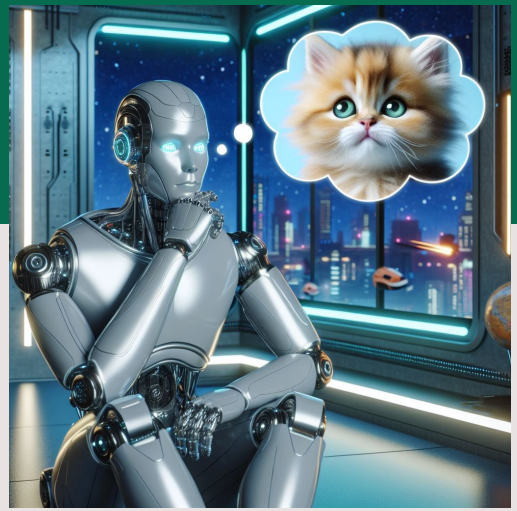


Large Language Models (LLMs) have at their core a supervised learning ML model to predict the next word (token) in a sentence.

E.g. given text “the cat sat on the” then a reasonable prediction for the next word is “mat”.



Next Token Prediction



Large Language Models (LLMs) have at their core a supervised learning ML model to predict the next word (token) in a sentence.

E.g. given text “the cat sat on the” then a reasonable prediction for the next word is “mat”. The model has not been programmed to know anything about cats (or even about English). It answers “mat” because this is statistically likely within the training data.



Beyond next-word-prediction

Training for next-word-prediction allows the LLM to learn the rules of a language, and also many facts. This is then supplemented by:

- **Training to give an answer** when asked a question, not just follow on with related text.
- **Training to "align"** with human values and preferences; i.e. make responses safe.



Beyond next-word-prediction

Training for next-word-prediction allows the LLM to learn the rules of a language, and also many facts. This is then supplemented by:

- **Training to give an answer** when asked a question, not just follow on with related text.
- **Training to "align"** with human values and preferences; i.e. make responses safe.
- **Training to reason:** work step-by-step instead of jumping to a result.



LLM Hallucinations



An **LLM hallucination** is when the text generated by an LLM is false. A better word for it might be **error** or **mistake**.



LLM Hallucinations



An **LLM hallucination** is when the text generated by an LLM is false. A better word for it might be **error** or **mistake**.

LLM hallucinations are often delivered in a confident, knowledgeable tone which makes them harder to identify.



LLM Hallucinations



An **LLM hallucination** is when the text generated by an LLM is false. A better word for it might be **error** or **mistake**.

LLM hallucinations are often delivered in a confident, knowledgeable tone which makes them harder to identify.

Hallucinations are inevitable from the way LLMs are created: sometimes there will be statistically likely next words that are wrong!



Compared to a few years ago…



- LLMs are making far fewer hallucinations.
- It is now easier to identify hallucinations: LLMs link to sources for humans to check.
  Note that the LLM itself is rarely critical of its sources: you need to do that critical review!



Compared to a few years ago…

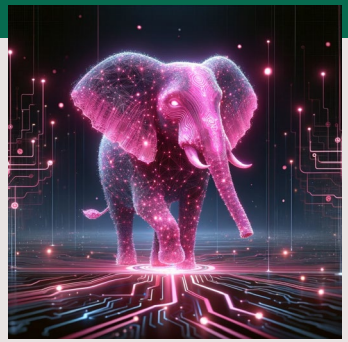


- LLMs are making far fewer hallucinations.
- It is now easier to identify hallucinations: LLMs link to sources for humans to check.
  Note that the LLM itself is rarely critical of its sources: you need to do that critical review!
- Tools that can focus LLMs on “high-quality” or “user-selected” data.

However, hallucinations can still occur, and they cannot be removed completely.



How to deal with hallucinations?



1. We can improve GenAI output quality through better prompting.

2. Even then, a system adopting AI must:

- Evaluate the quality of the AI at the task.
- Understand the risk posed by any hallucinations.
- If the risk is not minimal, then have a system to detect and fix them.



Questions so far?





NITE National Institute of Teaching and Education
part of the Coventry University Group

Coventry University | Group

AI and Data Protection



Section 3

Data Protection Laws



- There are multiple laws covering data protection in the UK, but most notably:
  - The Data Protection Act 2018
  - UK GDPR
- You probably regularly complete training on them! Quick test:
  - Who remembers what GDPR stands for?
  - How much can a GDPR fine be?

Data Protection Laws



- There are multiple laws covering data protection in the UK, but most notably:
  - The Data Protection Act 2018
  - UK GDPR
- GDPR = General Data Protection Regulation.
- Fines for organisations: up to £17.5M or 4% of global turnover (whichever is higher).

What is Covered by GDPR?



GDPR covers the processing of personal data.

- **Personal data:** information relating to an identified or identifiable individual.
  E.g. name, email, address, etc.
- **Processing:** any operation which is performed to data, manual or automated.

Using AI on data is a form of processing!

What do we have to do?



At the heart of the legislation is the requirement that data be stored, transferred and processed **securely** including:

- **Confidentiality:** it certainly should not be shared externally, and even internal sharing is limited to where necessary.
- **Integrity:** data remains accurate and complete.

Both of these require consideration with regards to AI tools.

Do cloud AI tools provide security?



Depends on the tool, and the T&Cs you agree to!

- **Personal licences** for AI tools likely do **not** guarantee data security (even the pro versions):
  - Data may be processed wherever there is capacity, leaving approved jurisdictions.
  - Data may be used to train future AI models.
- **Enterprise licences** for AI tools usually address these concerns.

What else?



What data protection concerns may remain when using AI tools with an Enterprise licence?



Other Possible Issues



- **Data Minimisation:** who has access to the data given to an Enterprise AI tool? Can we delete it once it is given?

- **Data Integrity:** What happens if a hallucination corrupts data? Do we have a “human-in-the-loop”?

NITE National Institute of Teaching and Education
part of the Coventry University Group

Coventry University Group

Practical Examples



Section 4

“For the Fallen” by Laurence Binyon

With proud thanksgiving, a mother for her children,
England mourns for her dead across the sea.
Flesh of her flesh they were, spirit of her spirit,
Fallen in the cause of the free.

Solemn the drums thrill; Death august and royal
Sings sorrow up into immortal spheres,
There is music in the midst of desolation
And a glory that shines upon our tears.

They went with songs to the battle, they were young,
Straight of limb, true of eye, steady and aglow.
They were staunch to the end against odds uncounted;
They fell with their faces to the foe.

They shall grow not old, as we that are left grow old:
Age shall not weary them, nor the years condemn.
At the going down of the sun and in the morning
We will remember them.

They mingle not with their laughing comrades again;
They sit no more at familiar tables of home;
They have no lot in our labour of the day-time;
They sleep beyond England's foam.

But where our desires are and our hopes profound,
Felt as a well-spring that is hidden from sight,
To the innermost heart of their own land they are known
As the stars are known to the Night;

As the stars that shall be bright when we are dust,
Moving in marches upon the heavenly plain;
As the stars that are starry in the time of our darkness,
To the end, to the end, they remain.

Let’s see if AI can help…



Suppose you want to set some reading comprehension tasks on this poem for your students. Could AI help us generate these?

Can it specialise the tasks well based on student age or ability?

Try it out now with your favourite AI tool and let me know what you think.

- There is no data protection worries here (use a free AI if you want).
- Are there any ethical concerns, and how can they be mitigated?

How did it do?

AI could certainly generate tasks. How suitable these are you are better judged than me to answer!

Key point: you have the responsibility to check the tasks!



Data Analysis Example



For this next example we have **two** spreadsheets of data. One spreadsheet gives the scores of your learners on a recent test; the other gives their attendance data provided by the school office.

The task is to bring all this data into the same spreadsheet so we can see if there are correlations between the two. We want to do this **correctly**, but **quickly**.

Options



There are lots of ways to solve this:

- If you are an Excel wizard you may just be able to do it yourself.
- You could offload the whole task to an AI tool: if so, factor in the time to **check the answer**.
- You may use a middle ground: asking the AI how to do things in Excel.

Try one now!

Note the data is all fictional (so there are no data protection concerns).

Answer and Challenges



As expected, there was a correlation (Pearson coeff. 0.73).

There were a few challenges about this task which made it non-trivial:

- The names were formatted differently.
- Two students had different variations of their first name.

Getting help from AI

Excel code to lookup a name from one sheet in another and pull in the corresponding value from a different column

Use `XLOOKUP` (Excel 365 and Excel 2021 or newer), which is simpler, more flexible, and doesn't break if you insert or move columns.

Option 1: `XLOOKUP` (Recommended)

Excel

```
=XLOOKUP(A2, Sheet2!A:A, Sheet2!B:B, "Not Found")
```

- `A2` : The cell containing the name you want to look up on your current sheet.
- `Sheet2!A:A` : The column in the other sheet where the names are located.
- `Sheet2!B:B` : The column in the other sheet containing the values you want to bring back.
- `"Not Found"` *(optional)*: The value returned if the name isn't matched.

Option 2: `VLOOKUP` (Legacy Excel)

If using Excel 2019 or earlier:

What line of Excel code will take a a sring in a cell of the form X Y and write it as Y, X?

If A1 contains `X Y` and you want `Y, X`, use:

Excel

```
1  =TEXTAFTER(A1," ")&", "&TEXTBEFORE(A1," ")
```

Example:

`John Smith → Smith, John`

If you need it to handle names containing **multiple spaces** and split specifically on the **last space**, I can give you that version too.

How can I calculate the Pearson correlation coefficient in Excel

To calculate the Pearson correlation coefficient (r) in Excel, you can use built-in functions depending on whether you are comparing **two datasets** or **multiple datasets at once**.

Method 1: Compare Two Variables (Single Pair)

Excel provides two identical functions to calculate Pearson's r. Both accept two ranges of numbers as inputs: `array1` and `array2` .

1. `PEARSON` Function

Excel

```
=PEARSON(array1, array2)
```

- **Example:** `=PEARSON(A2:A20, B2:B20)`

Getting AI to do it



StudentDatasheet2 StudentDatasheet1

Attached are two spreadsheets of data about the same students. Please produce one combined spreadsheet with all the data.

Reasoned for 5s ›

I combined the student records from StudentDatasheet1 and StudentDatasheet2, matching the abbreviated names “Jon” with “Jonathan” and “Oli” with “Oliver.” The workbook contains all 20 students with attendance and test scores. +1

Combined_Student_Data.xlsx
Saved in Matthew England's OneDrive

Both Gemini and Copilot could solve this correctly for me. But are there any concerns?

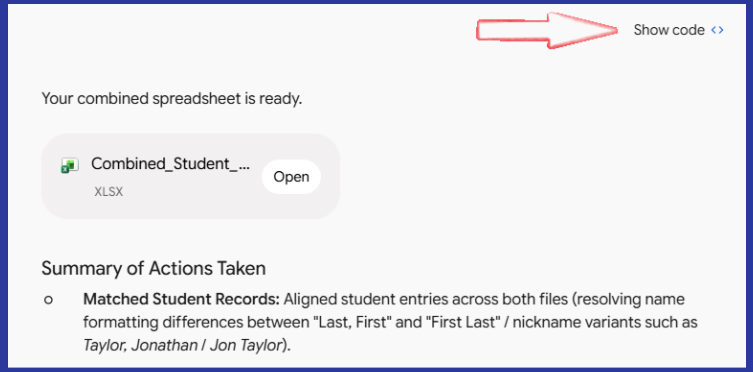
Possible Concerns?



- In this case we can easily and quickly check the AI has solved the task correctly.
- But for a larger dataset that might be more time-consuming than doing the task ourselves.

Possible Concerns?





- In this case we can easily and quickly check the AI has solved the task correctly.
- But for a larger dataset that might be more time-consuming than doing the task ourselves.
- For most AI tools, we can check their working on a task like this.

Possible Concerns?



Hide code

Python

```
import openpyxl
import pandas as pd
import os

# List directory contents to verify exact file names
print("Files in directory:", os.listdir('.'))

# Load sheet names for both excel files
xls1 = pd.ExcelFile('StudentDatasheet1.xlsx')
xls2 = pd.ExcelFile('StudentDatasheet2.xlsx')

print("Datasheet 1 sheets:", xls1.sheet_names)
print("Datasheet 2 sheets:", xls2.sheet_names)
```

- In this case we can easily and quickly check the AI has solved the task correctly.
- But for a larger dataset that might be more time-consuming than doing the task ourselves.
- For most AI tools, we can check their working on a task like this.
- But that will likely mean reading Python!

Further Reading



The UK Government has published:

- Guidance: Data and AI Ethics Framework. On the use of AI in the public sector. (Dec ‘25)
  https://www.gov.uk/government/publications/data-ethics-framework/data-and-ai-ethics-framework
- Guidance: Generative artificial intelligence in education. (Aug ‘25).
  https://www.gov.uk/government/publications/generative-artificial-intelligence-in-education/generative-artificial-intelligence-ai-in-education
- Support Materials: Using AI in education settings (May ‘26).
  https://www.gov.uk/government/collections/using-ai-in-education-settings-support-materials

NITE National Institute of Teaching and Education
part of the Coventry University Group

Coventry University | Group

Adverts



Section 5

Our new apprenticeship course



We offer a CertHE apprenticeship course: “**AI and Automation Practitioner**”.

Emphasises responsible AI innovation including ethics and data protection, while encouraging innovation & experimentation.

Learn about generative AI, automation design, data handling and analysis, along with governance, risk and compliance.

Our new apprenticeship course



We offer a CertHE apprenticeship course: “**AI and Automation Practitioner**”.

Emphasizes responsible AI innovation including ethics and data protection, while encouraging innovation & experimentation.

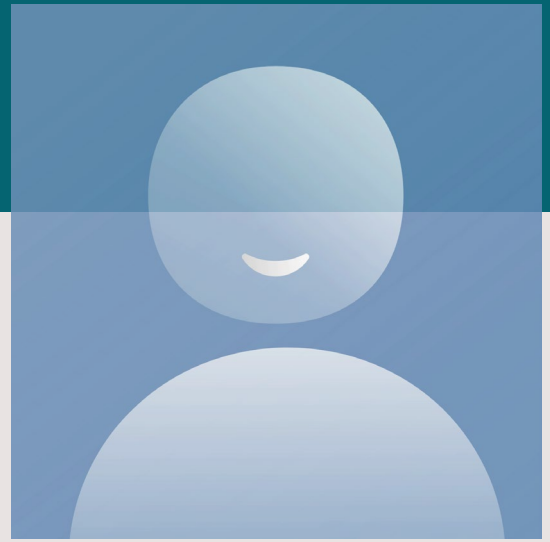
Learn about generative AI, automation design, data handling and analysis, along with governance, risk and compliance.

Course runs one day a week (Wednesday) over 18 months. Classes delivered online.

Can be funded by your employer’s apprenticeship levy.

First cohort started in September. We’ll have another start in January!

Thanks for Listening



If interested in the AI apprenticeship, contact:
apprenticeships@coventry.ac.uk



Please complete the feedback form once during the day and then all slides will be sent to you:
https://forms.cloud.microsoft/e/fGBx4P4RJ6

Find out about our Career Development courses

Find out about our teacher training offer

