During deployment data comes from the world and actions are carried out in the world.

What technologies should we use?

Questions to consider:

- Are the stakes high or low? (Can mistakes have severe consequences?)
- Is there abundant homogeneous data to learn from?
- Is there expert (prior) knowledge?
- Are deployed cases like the training cases?
- Is the data tabular or more unstructured (e.g., images, sounds)?
- If tabular, are most values identifiers (e.g., transaction/ product numbers) or discrete/real values or other?
Deploying AI

- Stake levels: low → high
- Abundant homogenous data: no → yes
- Deployed cases like training cases: yes
- Type of data: unstructured → tabular
- Values mostly identifiers: no → yes
- Utility assessment + reliable components + [human-in-the-loop]
- Expert knowledge: yes
- Bayesian model with informed priors: no → yes
- Simple model
- Causal model: no
- Deep learning
- Gradient boosted trees
- Relational models: yes
When the stakes are low, there is abundant homogenous data and the deployed cases are expected to be like the training cases, pure machine learning can be used.

Deep learning has proved to be the choice for unstructured and perceptual data where there are not pre-defined features, such as images, speech, text, and protein sequences.

For tabular data where the values in the tables can be used to construct features, gradient-boosted trees work well.

Relational models are used for tabular data where most values are identifiers.

If the assumption that deployment is like training is inappropriate, causal models can be used to adjust to the deployed situation.
If there is not much data, but there is expert knowledge, a causal model with informed priors (e.g., using a Dirichlet distribution) can combine expertise and data.

If there is little data and no expertise, a simple model such as a decision tree or a linear model is typically the best that can be done. Simplicity depends on the amount of data.

When the stakes are high:

- Carry out a complex cost–benefit analysis, based on the utility of all affected stakeholders.
- Ensure that failures and possibly bad outcomes can be explained and debugged
- Use a combination of techniques, where each component is well tested and reliable.