Applications of Neural Networks

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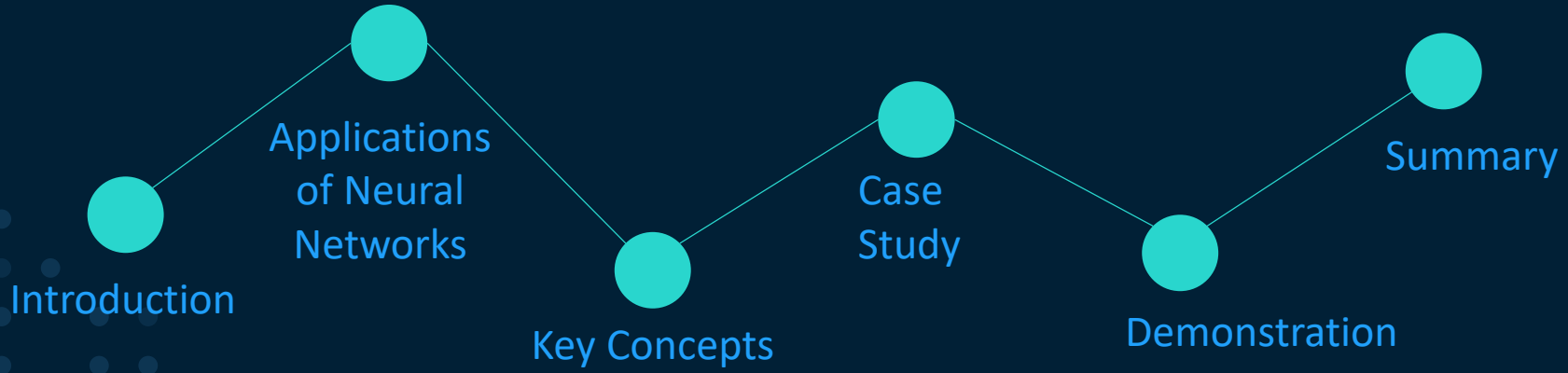
AGENDA



Applications of Neural Networks

Use Cases in Banking and Insurance

Examples of Potential Applications

- Claims Management
- Process Automation
- Fraud Detection
- Pricing
- Customer Analytics

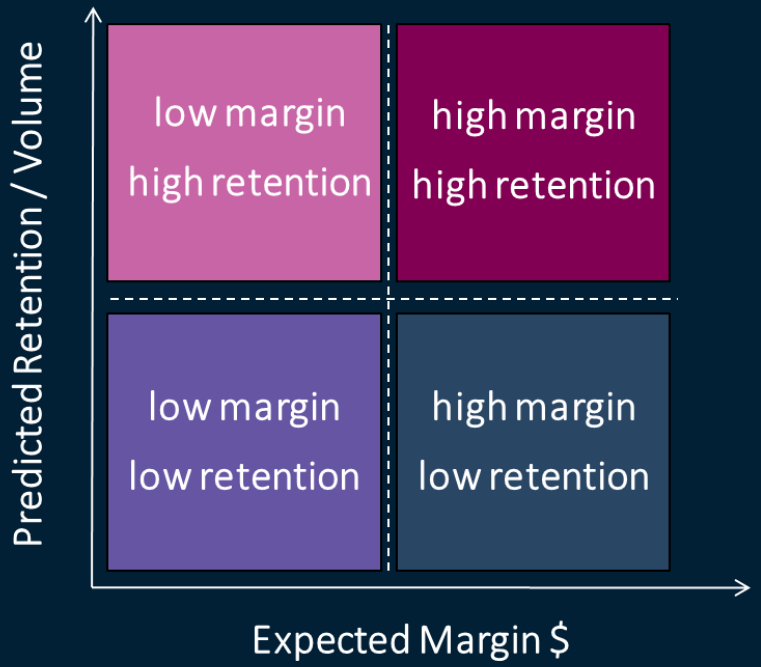
Applications to Insurance and Banking

Churn Analysis and CLV

Customer Lifetime Value

CLV = measure of long term economic value for each individual customer

Projections of **future margins** via **predicted future transactions**



Each customer is measured by projected margin, projected transactions, and thus future value.

A CLV-based strategy focuses on managing existing customers to higher future value, while prioritizing acquisitions based on expected lifetime value.

SAS Perspective: Customer Lifetime Value

- CLV is *not* a single metric.
- Using CLV appropriately is all about identifying, measuring, and managing *potential* value.
- Pulling the right levers, in the right way, is done by understanding how to *optimize* future value.
- Start with the measurable financial value, with an eye on evolving the non-financial measures of value (e.g. influencers' sentiment).

Customer Lifetime Value: How To Use It

Mitigate lapse

- Identify and retain moderate to high risk segments
- Win back high-value customers / households

Profile high-value acquisitions

- Profile customer value, relative to attributes used in prospecting
- Identify the combination of prospecting attributes which yields highest CLV

Cross-sell & Up-sell

- Identify the low-margin segments; target for up/cross-sell

Gain share-of-wallet

- Identify share-of-wallet opportunities through Look-Alike modeling

Performance reporting CLV KPI's

- Tracking and trending the metrics that drive future value

Optimize operational and marketing investments

- Measure the ROI from business decisions (e.g. change in price) in terms of the impact on customer equity

Mitigate Lapse: Survival Analysis

- Survival analysis is widely used for analyzing life-time data, where the target variable is the duration/survival time until an event of interest occurs.

- Survival analysis can be applied on many areas:
  - Medical research: predict survival time after treatment
  - Finance industry: predict when a borrower will likely to repay loan (credit risk)
  - Churn analysis: understand why and when clients unsubscribe or stop their services
  - Manufacturers: predict when an electronic device will break

Deep Learning for Survival Analysis

- A deep survival model is based on traditional survival models, such as, the proportional hazards models.
- Deep learning is used as the backbone based on traditional methods in order to improve overall model prediction.
- We can use our model to help us predict individual risk scores and to help us identify high-risk individuals within our data/customer base

Bias, Explainability, and Model Transparency

Bias:

How do we spot bias that could manifest itself through our data?

How do we ensure that we are not making discrimatory decisions?

Explainability and Model Transparency:

Do we understand our models?

What is the reasoning behind our model based decisions?

Data Management

Addressing key data challenges is imperative for successful AI deployment:

- Data availability and quality
- Data security & privacy
- Bias in training data

Data Ingestion & Management

Automation & standardization of data generation & processing

Data Governance & Lineage

Flexibility in source, structure & frequency

Model Output

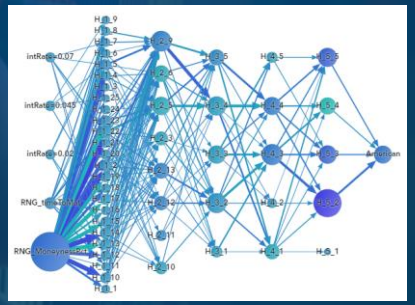
Validation, Benchmarking and Testing for unintended consequences

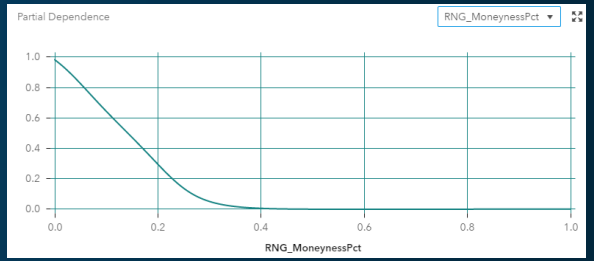
Feedback loop: potential to amplify bias

Model Interpretability

Understanding modern machine learning models:

- The internal calculations of modern machine learning models often do not lend to human intuition
- Common techniques to understand the models are:
  - Examining model outputs versus inputs (partial dependency, ICE)
  - Approximating model outputs with an easier model (LIME)
  - Additive variable importance (SHAP)





Case Study

Insurance Attrition

Insurance Attrition

How can we use deep learning to predict insurance attrition risk?

How do we identify high-risk individuals within our customer base?

Demonstration

Summary

Further Reading

https://github.com/sassoftware/python-dlpy/blob/master/examples/survival_analysis/Survival_Analysis_Employee_Churn_Analysis.ipynb

https://humboldt-wi.github.io/blog/research/information_systems_1920/group2_survivalanalysis/

http://medianetlab.ee.ucla.edu/papers/AAAI_2018_DeepHit

https://bmcmedresmethodol.biomedcentral.com/articles/10.1186/s12874-018-0482-1

Thanks!

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