Day in Life of Data Scientist

Women in Big Data

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NETFLIX

Agenda

- Presentation (10-15 minutes)
- Questions (10 minutes)
- Hands-on tutorial (45-60 minutes)

Data Science in One Slide

- Data manipulation/cleaning: SQL, sometimes Spark/PySpark/Scala
- Statistics and Probability: hypothesis testing, statistical significance, power studies, probability distributions, Bayesian methods
- Metric development: LTV, churn, CAC, NPS, DAU
- Analytics: Tableau, Mode, Periscope
- Supervised Machine Learning: linear/logistic regression, tree-based methods, kernel-based methods, neural networks (Deep Learning), genetic algorithms
- Unsupervised Machine Learning: clustering, PCA/ICA/SVD, LDA and other latent variable models, collaborative filtering, anomaly detection
- Reinforcement Learning: Q-learning, transfer learning, multi-armed bandits
- Non-ML Modeling techniques: Monte Carlo simulations, Markov chains, survival models, growth models, linear programming, constraint optimization
- Specializations: Natural Language Processing, Causal Inference, A/B testing, robotics/automation, operations
- Programming skills: Python/R, sometimes C++/C, procedural and/or object oriented, including version control (git)
- Productionalization of models: writing APIs, model hosting, working with software/algorithm engineers, scheduling data pipelines and automated model retraining
- Domain expertise: bias in data, social/business consequences of bias in predictions
- Problem definition
- Communication with business partners (technical and nontechnical): memos, visualizations, slides, dashboards, presentations
- Project management

Data Science

Can be any or all of those things, depending on:

- Your company
- Your team
- Your interests

A month in *my* life as a data scientist

- A typical project takes weeks/months.
- Project arc:
  - Start with the business questions
  - Make a technical plan
  - Create a proof of concept
  - Iterate/validate until you succeed or decide it can't be done
  - Communicate results back to stakeholders
  - Productionalize the model

A Typical Data Science Project (for me)

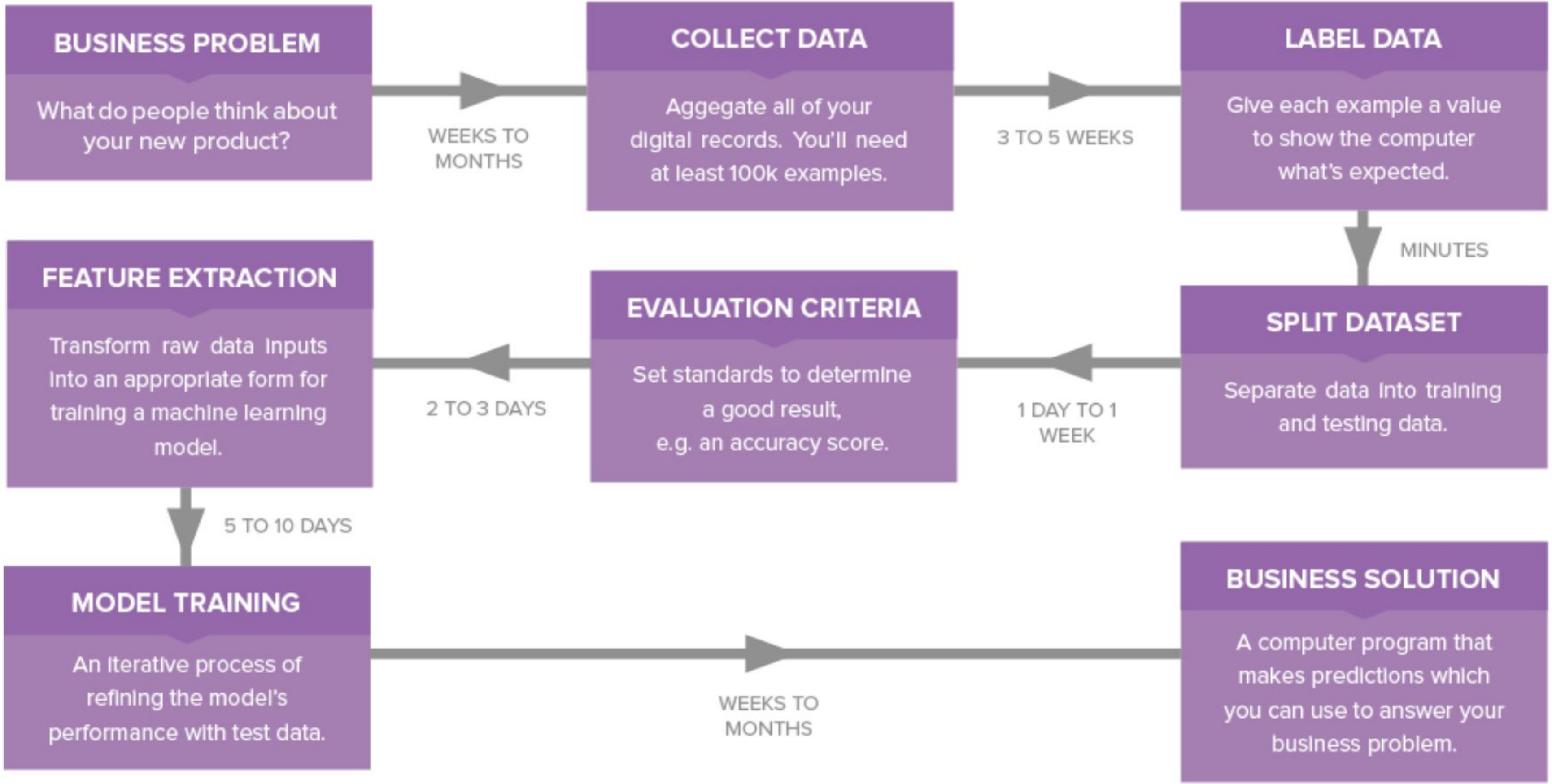
- **Start with the business questions**:
    - What is the business need?
    - What are we trying to do/measure/predict?
    - Who will be using this prediction or model?
    - What is a good proof of concept?
    - What is our metric of success?
    - Who is responsible for validation?
    - What is the time frame?
    - What other teams are involved?

A Typical Data Science Project (for me)

- **Make your technical plan:**
  - What data do we have available? How clean is it?
  - What techniques have others used to solve problems like this?
  - What tools should we use to do the data engineering, modeling, and productionalization?
  - What error metric are we optimizing?
  - If there are several possible techniques, which are the most promising?

A Typical Data Science Project (for me)

- **Create a proof of concept/iterate/validate:**
  - ***SQL*** to get/manipulate data (provided in clean, usable tables by data engineers)
  - Prototyping typically done in Jupyter notebooks (***Python***) with standard ***ML*** packages
    - Scikit-learn
    - XGBoost
    - Keras
    - Pandas
  - Early results often passed back and forth with stakeholders via spreadsheets and documents
  - Debugging/modeling suggestions from discussions and presentations to other data scientists
  - Early visualization is not fancy: Plots in Python or a basic ***Tableau*** dashboard
    - Matplotlib
    - Seaborn



BUSINESS PROBLEM

What do people think about your new product?

WEEKS TO MONTHS

COLLECT DATA

Aggegate all of your digital records. You'll need at least 100k examples.

3 TO 5 WEEKS

LABEL DATA

Give each example a value to show the computer what's expected.

MINUTES

SPLIT DATASET

Separate data into training and testing data.

1 DAY TO 1 WEEK

EVALUATION CRITERIA

Set standards to determine a good result, e.g. an accuracy score.

2 TO 3 DAYS

FEATURE EXTRACTION

Transform raw data inputs into an appropriate form for training a machine learning model.

5 TO 10 DAYS

MODEL TRAINING

An iterative process of refining the model's performance with test data.

WEEKS TO MONTHS

BUSINESS SOLUTION

A computer program that makes predictions which you can use to answer your business problem.

https://indico.io/the-founders-guide-to-machine-learning-why-you-shouldnt-build-your-own-models/

A Typical Data Science Project (for me)

- **Productionalize the model:**
  - Create an ***API*** (microservice) for other teams to call your model and get predictions
    - May involve software/data engineering teams, may not.
  - Decide on a ***Service Level Agreement***
    - How quickly does this need to be fixed if it breaks?
    - Who needs to be informed if the model/service changes?
    - What is my responsibility for maintenance or improvements?
  - Document with good comments and clean code in an internally available code repo
    - ***Code reviews***!
  - Document results with documents/presentations
  - Presentations/emails to socialize the results or a new model

Questions?

- **10 minutes**

Hands on Exercise: Proof of Concept

- Data science expertise from 1-10. Split and pair up!
- Go to https://tinyurl.com/NFLXWIBD2018
- Download Zip
- Extract downloaded zip file
- Start the terminal and CD to the location where you extracted the downloaded zip file contents
  - `cd Downloads/WIBD-Workshops-2018-master/Data\ Science/`
- Type the following in your terminal to launch notebooks
  - `jupyter notebook`

Resources:

- **WDI Data Set:** https://datacatalog.worldbank.org/dataset/world-development-indicators
- **Python for Data Science:** https://www.datacamp.com/courses/intro-to-python-for-data-science
- **Jupyter notebooks:** https://www.datacamp.com/community/tutorials/tutorial-jupyter-notebook
- **Pandas:** https://pandas.pydata.org/
- **SQL:** https://www.datacamp.com/courses/intro-to-sql-for-data-science
- **Probability:** https://www.datacamp.com/courses/foundations-of-probability-in-r
- **Machine Learning:** https://in.udacity.com/course/intro-to-machine-learning--ud120

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