I Can't Believe It's Not Real Data!

An Introduction into Synthetic Data

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Common Data Challenges

- Access to usable testing data
  - 35% of DS time is spent in the “data gathering” stage
  - Data is inaccessible due to PII
- Limited Data Sets
  - Lack of quality data can affect model training results
  - Prohibitively expensive or even impossible to collect more
- Biased Data
  - Data sets can be skewed towards representation of subjects in a data set

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Solution: Synthetic Data

- **Synthetic Data**: *Synthetic data is artificially annotated information that is generated by computer algorithms or simulations, commonly used as an alternative to real-world data.*

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Isn’t That Just Fake Data?

- Synthetic data is different from “fake” or “mock” data
  - You may be thinking of Faker
- Fake/mock data has no accuracy. It is purely random
  - Fake/mock data can be “too clean”
- Synthetic data can be nearly as accurate, or and in some cases even improve on the accuracy of real-world data.

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The Benefits of Synthetic Data

1. Make private data accessible and shareable
2. Generate more samples with limited data sets
3. Reduce bias in machine learning datasets

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1. Make Private Data Accessible & Shareable

- Data often contains PII (Personally Identifiable Information) making it *very risky* or even *illegal* for developers to work with
  - Developers and Data Scientists often don't want access to PII, developers want access to data that is relevant to their problem
- Generating a Synthetic Dataset allows you to have statistically similar data while removing the PII
  - This allows you to share your data, not only within the company but externally as well

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2. Augment Small Data Sets

- Not having enough of the right data is a serious bottleneck
  - Data is often your most valuable asset and collecting data is expensive and hard
- Synthetic Data allows you generate an unlimited amount of data based on a relatively small data set
  - Especially prevalent in the public sector, where poor data practices (such as storing data in “unreadable formats”) causes for an abundance of inaccessible data

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3. Reduce bias in Data Sets

- Biased data is a *big* problem
  - Leads to inaccurate models, unfair results, and may even cause harm
- If you can identify the bias in your data, you can use Synthetic Data to balance your data set
  - Reducing AI Bias with Synthetic Data in heart disease prediction models
  - 68% male data, 32% female, 2:1 ratio
  - Use Synthetic Data to generate more female patients to balance the data set
  - Increase in accuracy from 88.5% to 96.7%
  - 6.17% more females with heart disease can now be accurately diagnosed

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Is Synthetic Data Accurate?

- Unlike “fake” data, Synthetic data is nearly as accurate as the real data
  - In some cases, accuracy is improved
- Gretel’s Synthetic Data had a mean accuracy less than 1% from their real-world equivalents when tested against the top 8 ML datasets from Kaggle

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Current Challenges in Synthetic Data

- Highly dimensional datasets with hundreds or thousands of columns can be compute-intensive.
- Synthesizing relational datasets can require some manual configuration.
- Some privacy-preserving technologies such as differential privacy, require large amounts of data to provide strong privacy guarantees without degrading accuracy, and thus may not be appropriate for all datasets.
- Synthetic data generation requires time and effort.

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Synthetic Data in Action

- **Automotive and Robotics** — leveraging synthetic data to create simulated environments for training robots, self-driving car software, and even testing safety and crash prevention technologies.
- **Financial Services** — creating synthetic time-series data to enable data sharing that doesn't compromise their customers' privacy
- **Cybersecurity and Infosec** — using synthetic data to train machine learning models to better detect rare events including fraud and cyber attacks
- **Healthcare and Life Sciences** — creating synthetic genomic data to fuel medical breakthroughs and encourage better medical care
- **Manufacturing** — using synthetic data to simulate complex supply chain operations and predict where failures may occur.
- And More!

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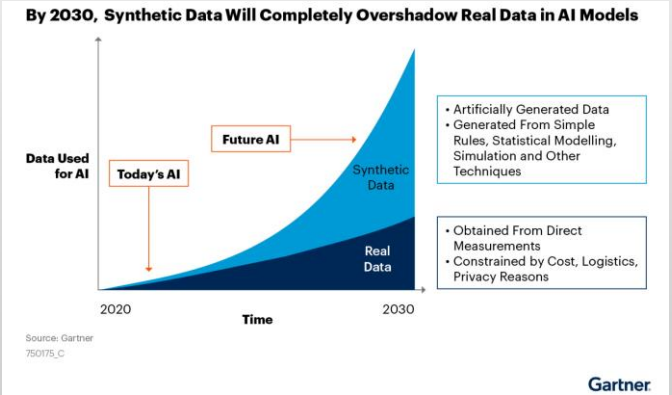
Is Synthetic Data the Future?

- By 2030 Gartner predicts that synthetic data will overshadow real data in AI models
  - Already happening today
  - Allows for easier compliance under data protections laws such as CDPR & CCPA
  - Reduces attack vector on data



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Getting Started Using Synthetic Data

- Many resources available
  - https://www.opensourceagenda.com/tags/synthetic-data
- Gretel makes it easy
  - All models are open source
  - No code options
  - Run in cloud or on-prem

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gretel-synthetics

- Open Source
- Multiple models
  - LSTM
  - GPT-3
  - More to come
- Train the synthetic data models yourself
  - You'll need a GPU
- https://github.com/gretelai/gretel-synthetics
- https://synthetics.docs.gretel.ai/en/stable/

Gretel Cloud

- Don’t have a GPU? Want to just try it out?
  - Try the free tier
- Many ways to run
  - Dashboard (No Code)
  - CLI
  - Python SDK
  - REST API

Demo

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Additional Resources

- https://docs.gretel.ai/
- https://github.com/gretelai/gretel-blueprints
- https://github.com/gretelai/fun-with-synthetic-data

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That’s all for this time!

- Follow me on Twitter @masonegger
- Follow Gretel on Twitter @gretel_ai to keep up with all things Synthetic Data
- Get started with Gretel https://gretel.ai

- Slides on my website, https://mason.dev

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