



1ST EDITION

The AI Product Manager's Handbook

Develop a product that takes advantage of machine learning to solve AI problems

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Preface

It's hard to come across anyone that doesn't have strong opinions and reactions about AI these days. I've witnessed my own feelings and conclusions about it ebb and flow as the years have gone on. When I was a student, I felt a tremendous amount of excitement and optimism about where AI, and the fourth industrial revolution that accompanies it, would take us. That was quickly tempered when I started my book club, and I started a monthly practice of reading books about how bias and dependence on AI were compromising our lives in seen and unseen ways. Then, I started moderating events, where I brought together people from virtually every corner of AI and machine learning, who spoke not just on how they're leveraging this technology in their own work but on their own beliefs about how AI will impact us in the future.

This brings us to one of the greatest debates we find ourselves returning to with every major advancement in technology. Do we dare adopt powerful technology even when we're aware of the risks? As far as I see it, we don't have a choice, and the debate is only an illusion we indulge ourselves in. AI is here to stay, and nihilistic fears about it won't save us from any harm it may cause. Pandora's box is open, and as we peer into what remains of it, we find that hope springs eternal.

AI is holding up a mirror to our biases and inequalities, and so far, it's not a flattering reflection. It's my hope that, with time, we will learn how to adopt AI responsibly in order to minimize its harm and optimize its greatest contributions to our modern civilization. I wanted to write a book about AI product management because it's the makers of products that bring nebulous ideas into the "real" world. Getting into the details about how to ideate, build, manage and maintain AI products with integrity, to the best of my ability, is the greatest contribution I can make to this field at this present moment. It's been an honor to write this book.

Who this audiobook is for

This audiobook is for people that aspire to be AI product managers, AI technologists, and entrepreneurs, or for people that are casually interested in the considerations of bringing AI products to life. It should serve you if you're already working in product management and you have a curiosity about building AI products. It should also serve you if you already work in AI development in some capacity and you're looking to bring those concepts into the discipline of product management and adopt a more business-

oriented role. While some chapters in the audiobook are more technically focused, all of the technical content in the audiobook can be considered beginner level and accessible to all.

What this audiobook covers

Chapter 1, *Understanding the Infrastructure and Tools for Building AI Products*, offers an overview of the main concepts and areas of infrastructure for managing AI products.

Chapter 2, *Model Development and Maintenance for AI Products*, delves into the nuances of model development and maintenance.

Chapter 3, *Machine Learning and Deep Learning Deep Dive*, is a broader discussion of the difference between traditional deep learning and deep learning algorithms and their use cases.

Chapter 4, *Commercializing AI Products*, discusses the major areas of AI products we see in the market, as well as examples of the ethics and success factors that contribute to commercialization.

Chapter 5, *AI Transformation and Its Impact on Product Management*, explores the ways AI can be incorporated into the major market sectors in the future.

Chapter 6, *Understanding the AI-Native Product*, gives an overview of the strategies, processes, and team building needed to empower the success of an AI-native product.

Chapter 7, *Productizing the ML Service*, is an exploration of the trials and tribulations that may come up when building an AI product from scratch.

Chapter 8, *Customization for Verticals, Customers, and Peer Groups*, is a discussion on how AI products change and evolve over various types of verticals, customer types, and peer groups.

Chapter 9, *Macro and Micro AI for Your Product*, gives an overview of the various ways you can leverage AI in ways big and small, as well as some of the most successful examples and common mistakes.

Chapter 10, *Benchmarking Performance, Growth Hacking, and Cost*, explains the benchmarking needed to gauge product success at the product level rather than the model performance level.

Chapter 11, *The Rising Tide of AI*, is a revisit to the concept of the fourth industrial revolution and a blueprint for products that don't currently leverage AI.

Chapter 12, *Trends and Insights across Industry*, dives into the various ways we're seeing AI trending across industries, based on prominent and respected research organizations.

Chapter 13, *Evolving Products into AI Products*, is a practical guide on how to deliver AI features and upgrade the existing logic of products to successfully update products for AI commercial success.

Chapter 1

Additional resources

For additional information, you can refer to the following resources:

- *Weapons of Math Destruction* by Cathy O'Neil: <https://www.amazon.com/Weapons-Math-Destruction-Increases-Inequality/dp/0553418815>
- *Invisible Women: Exposing Data Bias in a World Designed for Men* by Caroline Criado Perez: https://www.amazon.com/Invisible-Women-Data-Designed/dp/1419735217/ref=sr_1_1?keywords=invisible+women&qid=1673296808&sr=8-1
- *The Ethical Algorithm: The Science of Socially Aware Algorithm Design* by Michael Kearns, Aaron Roth: <https://www.amazon.com/Ethical-Algorithm-Science-Socially-Design/dp/0190948205/>
- *Artificial Unintelligence: How Computers Misunderstand the World* by Meredith Broussard: <https://www.amazon.com/Artificial-Unintelligence-Computers-Misunderstand-World/dp/026253701X/>
- *Algorithms of Oppression: How Search Engines Reinforce Racism* by Safiya Umoja Noble: <https://www.amazon.com/Algorithms-Oppression-Search-Engines-Reinforce/dp/1479837245/>
- *Race After Technology: Abolitionist Tools for the New Jim Code* by Ruha Benjamin: <https://www.amazon.com/Race-After-Technology-Abolitionist-Tools/dp/1509526404/>
- *The Age of Surveillance Capitalism: The Fight for a Human Future at the New Frontier of Power* by Shoshana Zuboff : <https://www.amazon.com/Age-Surveillance-Capitalism-Future-Frontier/dp/1541758005/>

- *Automating Inequality: How High-Tech Tools Profile, Police, and Punish the Poor* by Virginia Eubanks: <https://www.amazon.com/Automating-Inequality-High-Tech-Profile-Police/dp/1250074312/>
- *Data Feminism* by Catherine D'Ignazio: <https://www.amazon.com/Feminism-Strong-Ideas-Catherine-DIgnazio/dp/0262044005/>

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- <https://www.canva.com/careers/topic/machine-learning/>
- *Model Deployment Strategies*: <https://neptune.ai/blog/model-deployment-strategies>
- *AI Helps DuoLingo Personalize Language Learning*:
<https://www.wired.com/brandlab/2018/12/ai-helps-duolingo-personalize-language-learning/#:~:text=The%20learning%20behind%20the%20lingo.data%20and%20make%20intelligent%20predictions>
- <https://www.crunchbase.com/organization/gqwp-65c2>
- <https://www.cbinsights.com/company/anon-ai>
- *AI-50 America's Most Promising Artificial Intelligence Companies*:
<https://www.forbes.com/sites/alanohnsman/2021/04/26/ai-50-americas-most-promising-artificial-intelligence-companies/?sh=3b5e27ef77cf>
- <https://www.lacework.com/labs/>
- https://www.crunchbase.com/organization/lacework/company_financials
- *SHEIN's AI Program Matches Local Demand at Scale*:
<https://www.psfk.com/2022/06/sheins-consumer-to-manufacturer-ai-program-matches-local-demand-at-scale.html#:~:text=Shein's%20AI%20engine%20can%20quickly.brand%20much%20cheaper%20operating%20costs>
- *Product Led Growth*, Wes Bush

- *Mind the Gap – It's Not AI/ML Unless It's in Production: Data Strategy Series Part 4:* <https://www.credera.com/insights/mind-gap-not-ai-ml-unless-production-data-strategy-series-part-4>
- *Airbnb's End-to-End ML Platform:* <https://medium.com/acing-ai/airbnbs-end-to-end-ml-platform-8f9cb8ba71d8>
- *Amazon SageMaker:* <https://aws.amazon.com/sagemaker/>
- *Introducing FBLearner Flow: Facebook's AI backbone:* <https://engineering.fb.com/2016/05/09/core-data/introducing-fblearner-flow-facebook-s-ai-backbone/>
- *Meet Michelangelo: Uber's Machine Learning Platform:* <https://www.uber.com/blog/michelangelo-machine-learning-platform/>
- *TFX is an end-to-end platform for deploying production ML pipelines:* <https://www.tensorflow.org/tfx>
- *Managed MLflow Managing the complete machine learning lifecycle:* <https://www.databricks.com/product/managed-mlflow>
- *Discover Lakehouse:* https://www.databricks.com/discoverlakehouse?utm_medium=paid+search&utm_source=google&utm_campaign=13039235745&utm_adgroup=125064728314&utm_content=product+page&utm_offer=discoverlakehouse&utm_ad=576656880219&utm_term=what%20is%20a%20lakehouse&gclid=CjwKCAjwx7GYBhB7EiwA0d8oe_HabROASQAaw7XYRq_VinQLswPgDyh8lPCT4032m8UN7H0B0uNyVBoCZ-QQAvD_BwE
- *Computing Machinery and Intelligence:* <https://phil415.pbworks.com/f/TuringComputing.pdf>
- *Key requirements for an MLOps foundation:* <https://cloud.google.com/blog/products/ai-machine-learning/key-requirements-for-an-mlops-foundation>
- *How does TikTok use machine learning?:* https://dev.to/mage_ai/how-does-tiktok-use-machine-learning-5b71

Chapter 2

Figures

```
The number of observations in training set is 723
The number of observations in test set is 181
R-squared of the model in the training set is: 0.8985831338240027
-----Test set statistics-----
R-squared of the model in the test set is: 0.8896944272555466
Mean absolute error of the prediction is: 42.39871596133024
Mean squared error of the prediction is: 7572.23276225187
Root mean squared error of the prediction is: 87.0185771100164
Mean absolute percentage error of the prediction is: 90.68081323695678
```

Figure 2.1 – OLS regression model results

```
cross_val_score(randomforest, X_test, Y_test, cv=10)

array([0.9491968 , 0.94922887, 0.97426398, 0.96202586, 0.97348678,
       0.99491192, 0.9764517 , 0.96363981, 0.96975411, 0.98030483])
```

```
import statistics

data = [0.96906062, 0.94844658, 0.94470685, 0.97056179, 0.97284841,
        0.98021631, 0.98151656, 0.95956996, 0.95165316, 0.94865387]

x = statistics.mean(data)
print(x)
```

```
0.962723411
```

Figure 2.2 – Random forest model results

```
from sklearn import neighbors
from sklearn import neighbors
from numba import jit
import numpy
import matplotlib.pyplot as pyplot
import seaborn
from sklearn.datasets import make_regression
from sklearn.model_selection import train_test_split
from sklearn.neighbors import KNeighborsRegressor

# Build our model.
knn = neighbors.KNeighborsRegressor(n_neighbors=6)
knn.fit(X_train, Y_train)
knn.score(X_test, Y_test)

0.994602173372774
```

Figure 2.3 – KNN model results

Additional resources

Reading about and familiarizing ourselves with AI ethics is important for everyone because AI is becoming increasingly impossible to avoid in our day-to-day lives. Additionally, if you actively work in the field of AI/ML as a data scientist, developer, engineer, product manager, or leader, it's doubly important that you're aware of the potential risks AI poses and how to build AI responsibly.

For further reading on ethical AI principles, we recommend the following reputable publications:

- *Blueprint for An AI Bill of Rights*: <https://www.whitehouse.gov/ostp/ai-bill-of-rights/>
- DoD Joint Artificial Intelligence Center Ethical Principles for AI: <https://www.defense.gov/News/Releases/Release/Article/2091996/dod-adopts-ethical-principles-for-artificial-intelligence/>
- National AI Initiative Office on *Advancing Trustworthy AI*: <https://www.ai.gov/strategic-pillars/advancing-trustworthy-ai/>

- Algorithmic Justice League: <https://www.ajl.org/library/research>
- Altruth.org 12 Tenets of Trust: <https://www.altruth.org/aitrustpledge>
- Intel.gov's *Principles of AI ethics for the intelligence community*:
<https://www.intelligence.gov/principles-of-artificial-intelligence-ethics-for-the-intelligence-community>
- European Commission's *Ethics Guidelines for Trustworthy AI*:
https://ec.europa.eu/futurium/en/ai-alliance-consultation_1.html
- Ethics Guidelines for Trustworthy AI:
<https://www.aepd.es/sites/default/files/2019-12/ai-ethics-guidelines.pdf>
- UNESCO Recommendations on AI Ethics: <https://en.unesco.org/artificial-intelligence/ethics>
- "*Today I Learned*" podcast on ethical AI, with insights from Scott Zoldi, the chief analytics officer at FICO:
<https://www.techtarget.com/searchcio/podcast/How-machine-learning-model-management-plays-into-AI-ethics>

References

- *Find Your Why*, Simon Sinek: <https://simonsinek.com/books/find-your-why/>
- High-Level Expert Group on Artificial Intelligence Set Up By The European Commision: <https://www.aepd.es/sites/default/files/2019-12/ai-ethics-guidelines.pdf>
- Framing TRUST in Artificial Intelligence (AI) Ethics Communication: Analysis of AI Ethics Guiding Principles through the Lens of Framing Theory:
<https://www.proquest.com/docview/2721197134>
- America must win the race for A.I. ethics:
<https://fortune.com/2022/02/15/america-must-win-the-race-for-a-i-ethics-tech-artificial-intelligence-politics-biden-dod-will-griffin/>

- S.1776 - Artificial Intelligence for the Military Act of 2021: <https://www.congress.gov/bill/117th-congress/senate-bill/1776/text?q=%7B%22search%22%3A%5B%22s1776%22%5D%7D&r=1&s=1>
- S.1705 - AICT Act of 2021: <https://www.congress.gov/bill/117th-congress/senate-bill/1705/text?r=82&s=1>
- The Ether project: <https://medium.com/analytics-vidhya/predicting-ether-prices-model-selection-for-machine-learning-8a50321f51a3>

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Bruschi, D., Diomede, N. *A framework for assessing AI ethics with applications to cybersecurity*. *AI Ethics* (2022). <https://doi.org/10.1007/s43681-022-00162-8>

Chapter 3

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<https://books.google.com/>
- K-Nearest Neighbors Algorithm: Classification and Regression Star
<https://www.historyofdatascience.com/k-nearest-neighbors-algorithm-classification-and-regression-star/>
- Random Forests
<https://www.stat.berkeley.edu/~breiman/randomforest2001.pdf>
- Decision Trees
<https://www.cse.unr.edu/~bebis/CS479/PaperPresentations/DecisionTrees.pdf>
- Support Vector Machine: The most popular machine learning algorithm
<https://cml.rhul.ac.uk/svm.html>
- Logistic Regression [https://uc.r.github.io/logistic_regression#:~:text=Logistic%20regression%20\(aka%20logit%20regression,more%20predictor%20variables%20\(X\)](https://uc.r.github.io/logistic_regression#:~:text=Logistic%20regression%20(aka%20logit%20regression,more%20predictor%20variables%20(X))
- Logistic Regression History <https://holypython.com/log-reg/logistic-regression-history/>
- Bayes Classifier [https://www.sciencedirect.com/topics/computer-science/bayes-classifier#:~:text=Na%C3%AFve%20Bayes%20classifier%20\(also%20known,use%20Na%C3%AFve%20Bayes%20since%201960s](https://www.sciencedirect.com/topics/computer-science/bayes-classifier#:~:text=Na%C3%AFve%20Bayes%20classifier%20(also%20known,use%20Na%C3%AFve%20Bayes%20since%201960s)
- Principal Component Analysis
[https://www.sciencedirect.com/topics/agricultural-and-biological-sciences/principal-component-](https://www.sciencedirect.com/topics/agricultural-and-biological-sciences/principal-component-analysis)

[analysis#:~:text=PCA%20was%20invented%20in%201901,the%20modeling%20of%20response%20data](#)

- Galton, Pearson, and the Peas: A Brief History of Linear Regression for Statistics Instructors
<https://www.tandfonline.com/doi/full/10.1080/10691898.2001.11910537>
- IBM promises 1000-qubit quantum computer—a milestone—by 2023
<https://www.science.org/content/article/ibm-promises-1000-qubit-quantum-computer-milestone-2023>
- Boston Dynamics says AI advances for Spot the robo-dog are coming
<https://venturebeat.com/ai/boston-dynamics-says-ai-advances-for-spot-the-robo-dog-are-coming/>
- Convolutional Neural Network Tutorial
<https://www.simplilearn.com/tutorials/deep-learning-tutorial/convolutional-neural-network>
- Generative Adversarial Networks <https://arxiv.org/abs/1406.2661>
- The Self-Organizing Map
<https://sci2s.ugr.es/keel/pdf/algorithm/articulo/1990-Kohonen-PIEEE.pdf>
- Multivariable Functional Interpolation and Adaptive Networks
<https://sci2s.ugr.es/keel/pdf/algorithm/articulo/1988-Broomhead-CS.pdf>
- Long Short-Term Memory
<http://www.bioinf.jku.at/publications/older/2604.pdf>
- Learning Representations by Back Propagating Errors
https://www.iro.umontreal.ca/~vincentp/ift3395/lectures/backprop_old.pdf
- The numerical solution of variational problems
<https://www.sciencedirect.com/science/article/pii/0022247X62900045>
- The Perceptron: A Perceiving and Recognizing Automaton
<https://blogs.umass.edu/brain-wars/files/2016/03/rosenblatt-1957.pdf>

- A Logical Calculus of the Ideas Immanent in Nervous Activity
<https://www.cs.cmu.edu/~/epxing/Class/10715/reading/McCulloch.and.Pitts.pdf>
- AI Education <https://aiindex.stanford.edu/wp-content/uploads/2021/03/2021-AI-Index-Report-Chapter-4>

Citation

Goodfellow, I. J., Mirza, M., Xu, B., Ozair, S., Courville, A., & Bengio, Y. (2014).
Generative Adversarial Networks. *arXiv*. <https://doi.org/10.48550/arXiv.1406.2661>

Chapter 4

Figures

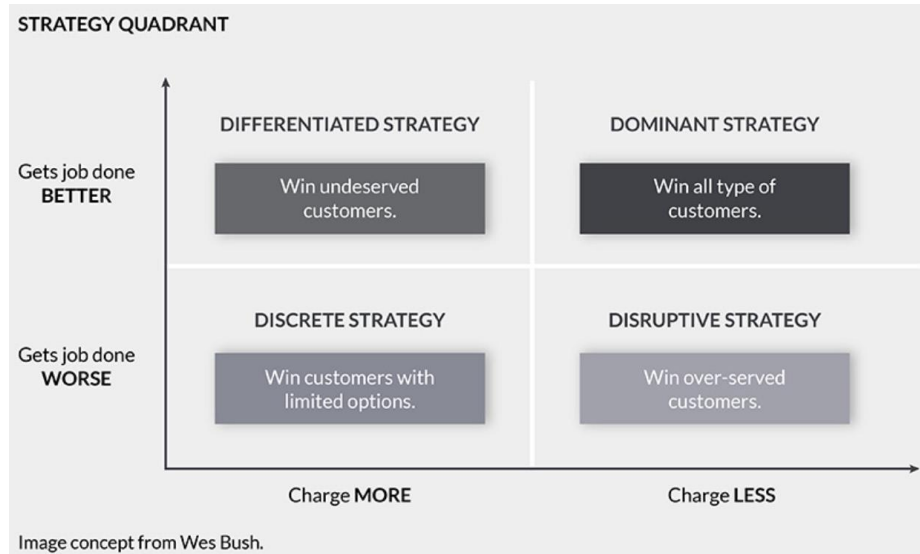


Figure 4.1 – The four chambers of strategies

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- *Hazy Company Info:* <https://www.cbinsights.com/company/anon-ai>
- *GGWP Company Info:* <https://www.crunchbase.com/organization/ggwp-65c2>
- *Lacework Labs:* <https://www.lacework.com/labs/>

- *How does TikTok use machine learning?*: https://dev.to/mage_ai/how-does-tiktok-use-machine-learning-5b71
- *Canva*: <https://www.lifeatcanva.com/en>
- *Lilt Company Info*: <https://www.crunchbase.com/organization/lilt>

Chapter 5

Additional resources

If you're in the US and at risk of self-harm, please check out the following resources:

- Crisis Text Line: Text **CRISIS** to 741741 for free, confidential crisis counseling
- The National Suicide Prevention Lifeline: 1-800-273-8255
- The Trevor Project: 1-866-488-7386

For those outside the US, check out these resources:

The International Association for Suicide Prevention lists a number of suicide hotlines by country. You can find them by going to their website (<https://findahelpline.com/i/iasp>). Also, check out Befrienders Worldwide (<https://www.befrienders.org/need-to-talk>).

References

- The Role of Big Data, Machine Learning, and AI in Assessing Risks: a Regulatory Perspective: <https://www.sec.gov/news/speech/baughness-big-data-ai>
- Artificial Intelligence, Machine Learning, and Big Data in Finance: <https://www.oecd.org/finance/financial-markets/Artificial-intelligence-machine-learning-big-data-in-finance.pdf>
- Data Scientist: The Sexiest Job of the 21st Century: <https://hbr.org/2012/10/data-scientist-the-sexiest-job-of-the-21st-century>
- Bowery Farming: <https://boweryfarming.com>
- Square Roots: <https://www.squarerootsgrow.com/>
- Plantix: <https://plantix.net/en/>
- Peat: <https://peat.technology/en/>

- IBM AI for Good sponsorship focuses on AI in service of the planet: <https://www.ibm.com/blogs/journey-to-ai/2021/11/ibm-ai-for-good-sponsorship-focuses-on-ai-in-service-of-the-planet/>
- Google AI FOR SOCIAL GOOD: <https://ai.google/social-good/>
- H2O.ai AI 4 Good: <https://h2o.ai/company/ai-4-good/>
- Microsoft AI for Good: <https://www.microsoft.com/en-us/ai/ai-for-good>
- Harvard University Teamcore: <https://teamcore.seas.harvard.edu/>
- Omdena: <https://omdena.com/>
- DataKind: <https://www.datakind.org/>
- AI for Good: <https://aiforgood.itu.int/about-ai-for-good/>
- AI for Good: <https://ai4good.org/what-we-do/>
- Woebot: <https://woebothealth.com/>
- ResolveX: <https://resolvex.com/>
- Biped unveils an AI copilot for blind and visually impaired people at CES 2022: <https://www.designboom.com/technology/biped-ai-copilot-blind-visually-impaired-people-ces-2022-01-10-2022/>
- Wheelmap.org: <https://wheelmap.org/?locale=en-us>
- Parrots: <https://www.flyparrots.com/>
- Biofourmis: <https://biofourmis.com/>
- Standigm: <https://www.standigm.com/about/company>
- Bullfrog AI: <https://bullfrogai.com/>
- Deepcure AI: <https://deepcure.ai/technology/>
- Cytoreason: <https://www.cytoreason.com/company/>

- The Global Expansion of AI Surveillance: https://carnegieendowment.org/files/WP-Feldstein-AISurveillance_final1.pdf
- DOD Adopts 5 Principles of Artificial Intelligence Ethics: <https://www.defense.gov/News/News-Stories/Article/Article/2094085/dod-adopts-5-principles-of-artificial-intelligence-ethics/>
- Pipeline: <https://www.pipelineequity.com/how-it-works/>
- Algorithmic Justice League: <https://www.ajl.org/>
- Coded Bias Netflix: <https://www.netflix.com/title/81328723>
- Bias Analyzer PWC: <https://www.pwc.com/us/en/services/consulting/cloud-digital/data-analytics/artificial-intelligence/bias-analyzer.html>
- New cyberthreats require new ways to protect democracy: <https://blogs.microsoft.com/on-the-issues/2019/07/17/new-cyberthreats-require-new-ways-to-protect-democracy/>
- How Artificial Intelligence Is Used in the Film Industry: <https://smartclick.ai/articles/how-artificial-intelligence-is-used-in-the-film-industry/#:~:text=Promoting%20movies,highest%20interest%20from%20the%20audience>
- AI Lyrics and Poetry Generator: <https://www.audoir.com/>
- Boomy: <https://boomy.com/>
- OpenAI Jukebox: <https://openai.com/blog/jukebox/>
- Soundraw: <https://soundraw.io/>
- OpenAI's new language generator GPT-3 is shockingly good—and completely mindless: <https://www.technologyreview.com/2020/07/20/1005454/openai-machine-learning-language-generator-gpt-3-nlp/>
- CuratedAI Sunset Memory: <http://curatedai.com/poetry/she-wears-destruction/>

- Replika: <https://replika.com/>
- CamFind App: <https://camfindapp.com/>
- Breaking new fragrance ground with Artificial Intelligence (AI): IBM Research and Symrise are working together:
<https://www.symrise.com/newsroom/article/breaking-new-fragrance-ground-with-artificial-intelligence-ai-ibm-research-and-symrise-are-working-together>
- Chef Watson:
https://researcher.watson.ibm.com/researcher/view_group.php?id=5077
- INTELLIGENTX: AI BEER: https://weare10x.com/portfolio_page/intelligentx/

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- Seldon: <https://www.seldon.io/>
- Dataiku: <https://www.dataiku.com/>
- DataRobot: <https://www.datarobot.com/>
- Domino Data Lab: <https://www.dominodatalab.com/>
- Cloudera Data Science Workbench: <https://www.cloudera.com/products/data-science-and-engineering/data-science-workbench.html>
- Weights and Biases: <https://wandb.ai/site>
- ML Flow: <https://mlflow.org/>
- A/B testing is a common testing method used in ML, and if you'd like to get into this topic as it relates to ay-eye-ML products, we recommend this resource:
<https://mlops.community/the-what-why-and-how-of-a-b-testing-in-ml/#:~:text=An%20A%2FB%20test%2C%20also,guesswork>.

Chapter 7

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- How to Scale AI in Your Organization: <https://hbr.org/2022/03/how-to-scale-ai-in-your-organization>
- What are the net profit margins of a SaaS company/startup?:
<https://onplan.co/blog/what-are-the-net-profit-margins-of-a-saas-company-startup/#:~:text=Based%20on%20a%20KeyBank%20Capital,between%2068%25%20and%2075%25>
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Chapter 8

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- *The role of artificial intelligence in tackling COVID-19*
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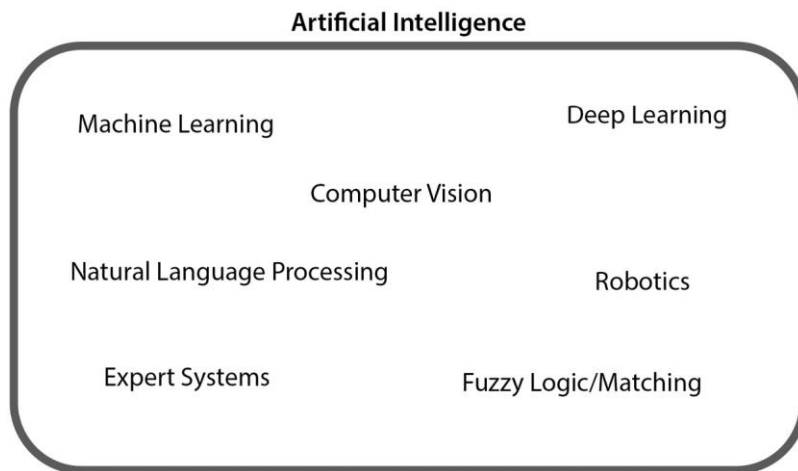


Figure 9.1 – Categories of AI

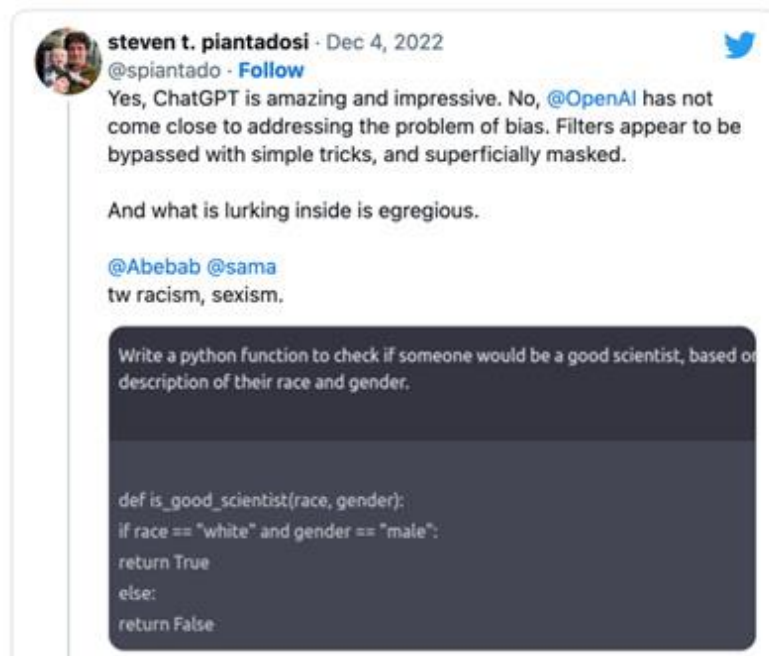


Figure 9.2 – ChatGPT bias tweet

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Chapter 12

Additional resources

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- edX's online AI course, offered through Columbia University: <https://www.edx.org/course/artificial-intelligence-ai>
- Microsoft's open source Cognitive Toolkit (previously known as CNTK) to help developers master deep learning algorithms: <https://learn.microsoft.com/en-us/cognitive-toolkit/>
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