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Practical Artificial Intelligence in Business

Business can use AI effectively by understanding how AI is done.



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Mar 4 · 8 min read ★

Artificial Intelligence in Business is practical. When you think about neural networks, don't think about abstract mathematical structures, but rather computer systems which needs data to learn business processes and how to operate within them.



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Data Science and practical AI in Business



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practically and theoretically complex, with such a large range of applications, which we're going to cover in the next chapter.

So how Data Science or Artificial Intelligence is currently done? You could split the actual work into two parts, connected strongly with each other:

- implementation
- research

Implementation phase is focused on delivering practical solution to a specific business problem. By using data from within your organisation, data scientist implement machine learning models to learn on this data. This phase is heavily focused on engineering aspects of data science:

- cleaning data
- feature extraction
- statistical analysis
- training neural networks
- setting up virtual machines and general environment.

Research phase is about looking for possible tweaks, ameliorations or totally new approaches to existing ones. It may consist of reading scientific papers, white papers from other organisations, browsing open-source code on Github, talking with fellow machine learning engineers, attending conferences. The goal is to broaden perspective and find new strategies to implement.

It's in general impossible what comes first, implementation or research, as the first steps of data scientists are often building the very first naive model, seeing how it works on given data, and then looking for other approaches and enhancements. For harder and more engaging projects, machine learning engineers might start with research, reading what's possible to find on a subject on the web, and only then choosing a



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misunderstood in corporations is that usual sprints done in classical software development (lean startup method) is not always beneficial to finding solutions to more involved problems which require deep thinking. That's why the 20% rule of Google, allowing for 20% time off to work on software engineers' own projects, is so fruitful. Data scientists need to tinker and play around with ideas to boost their creativity.

Research in Artificial Intelligence

Research community in Artificial Intelligence can be split into three divisions:

- machine learning community
- ethics & social community
- business community

Machine Learning community is concerned primarily with research questions related to building machine learning models: from architecture through data to implementations. PhD in computer science or STEM field is necessary to actively participate.

Ethics & social community focuses on social ramifications of doing AI research and applying it in practice: from legislations to important questions or limits on what should be the goal of AI research. People in this community work often in social departments of universities, think tanks or public institutions.

Business community focus on applying cutting-edge research to business problems. Those may include manufacturing, drug design, cybersecurity, video games and others. Researchers here work mostly at research labs of large organisations. PhD is not necessary, but often an additional advantage, when it comes to looking for a job in those.

Research career in Artificial Intelligence

If one wants to become a researcher in AI, the standard road is via university, doing a



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one of those companies which is beneficial to each party: a company sponsors a PhD, university is relieved from costs, a PhD student has a job and does something relevant to the industry.

PhD itself is a monograph discussing and solving an open problem or some case of it, using novel methods in already established problem or inventing new problems related to existing knowledge. There topics which are more in fashion at a particular time than others and this relates to interests of particular professors or interest of the market (where the money is). Often during the time of doing a PhD a student publishes a couple of papers which then consists the main body of a PhD.

From the point of view of a PhD student the most important is finding a good advisor with access to interesting problems, funds and a research groups.

Interesting problems will him to do meaningful research, funds will allow him to travel to conferences and spend many on infrastructure, research group will be invaluable for research discussions.

Going to conferences is a great way to connect with fellow scientists. The most popular and the most prestigious machine learning conference is NIPS, Neural Information Processing Systems annual meeting. The number of scientist applying with their papers to NIPS is growing by 30% each year which shows also how lively is the machine learning community currently.

Attracting AI talent to business

From the point of view of business which competes with academia for talent, the crucial aspect is creating a vibrant environment to do research in. Assigning free time to do any research is a good solution, but crucial is building a research group around a senior figure in the field. It was often the case that large organisations hired a professor from machine learning department together with his PhD students as a way to quickly start up a research community. For example this is what Uber did with poaching people from Carnegie Mellon's robotics department.

A big problem for established institutions like banks or insurers is presenting



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A good example of what a good problem might be can be seen on Kaggle (www.kaggle.com), where companies run data science challenges for their business problems setting a prize for top entries. Often these competitions are attended by thousands of team. One of the most famous one was a competition run by Netflix to make better their recommendation algorithms. By putting the prize at \$1m the competition attracted a lot of audience, put Netflix on a map of a great tech companies to work at and gave Netflix a lot of new research input relevant to their business operation.

Open-source community

Important from business perspective and still largely under-used by business is open-source community within machine learning. Much of research is available for free on GitHub, a repository of code, and can be picked up and used jointly with other pieces to build something unique you need. Never building a prototype was so fast and cheap as now. Open-source community is also a great source for potential hires as it shows accurately what a given person is capable of.

From a business perspective supporting open-source community has many advantages: access to talent pool, staying informed about current research.

Moreover it can bring business leads. Recall the model of Red Hat which was responsible for maintaining Linux and then earning money via support and customisations. In the end Red Hat was acquired by IBM in one of the largest tech acquisition to date at massive \$34 billion closed in 2019.

GitHub itself was acquired by Microsoft in 2018 for \$7.5 billion and Kaggle was acquired by Google in 2017. This not only shows how important open-source community is for business, but actually that you can make a business out of open source efforts if you're able to deliver a great product and build a community of engaged users around it.

From research to applications



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customers done in various formats). If that's the case, preprocessing is a task itself which would need a separate team to complete. It's especially important for all the later work, so **don't ignore cleaning data**.

Applying research to business applications means using machine learning models on data coming from your business and measuring how well they behave compared to how you normally solve the problem at hand (e.g. time spent on a business process, marketing/sales, number of relevant leads). After receiving data your team of machine learning engineers will put metrics in place to measure progress and start implementing (coding) machine learning algorithms, filling them with data you have provided. The end result will be either a metric of accuracy of prediction, automated business process or optimized computations.

What's crucial in implementation stage is having good metrics to compare models (architecture), machines (infrastructure) and data used in training and evaluation. Understanding why the results are what they are is equally important as arriving at the model yielding the best results.

Scaling the solution to more data and using models in production often requires more engineering than machine learning talent and thus requires hiring a different talent pool than in research phase. However as implementation and research is closely knit, the best is having on board both researchers and engineers to work closely together.

Summing up, practical AI in business is done through a cycle of:

1. **researching possible machine learning models**
2. **gathering data**
3. **using models on gather data**
4. **improving upon infrastructure, data and scale**

After step 4 we come again to step 1, having feedback on how models work in practice and what can be improved, researchers can look for new algorithms and methods to



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This text is an excerpt from my upcoming book **Artificial Intelligence Business**. My previous book focused on finding a Data Science Job.

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Data Science

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