HOW TO USE AI IN BUSINESS

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FOREWORDS

Artificial intelligence (AI) and machine learning (ML) are hot topics now. The hype in the media is causing concern among employees about their jobs and interest in businesses about how to benefit from it. To avoid misunderstandings and help individuals and organizations get the best out of this technological leap, we would like to share our views and experience of the real-world benefits of artificial intelligence.

In this guide, we explain the key elements of artificial intelligence, why it is important and what it actually is:

- Introduction to artificial intelligence
- What is artificial intelligence?
- Machine learning in practice
- Issues to consider
- Use cases for artificial intelligence

INTRODUCTION TO AI

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Enterprises will deploy AI to make decisions and provide real-time suggestions.

Source: Predictions 2018: The Honeymoon For AI Is Over
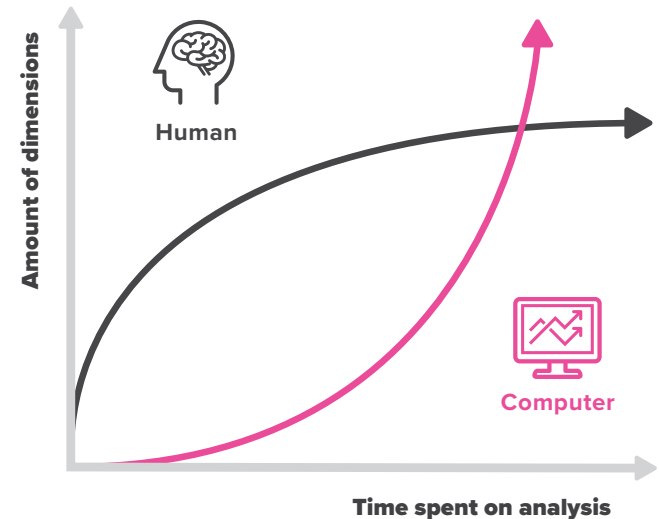
20%
in 2018

WHY IS AI TRENDING NOW?

Humans and computers are natural data analyzers. Humans can recognize patterns quickly in small amounts of data, while computers tirelessly repeat routine work. **By combining these two talents, we can build AI that reacts quickly to new situations based on a huge dataset.** This is a big advantage in the data and systems ecosystem, which is growing increasingly complex at an exponential rate.

By studying business opportunities and related data, we are able to understand how, when and why AI can solve problems.
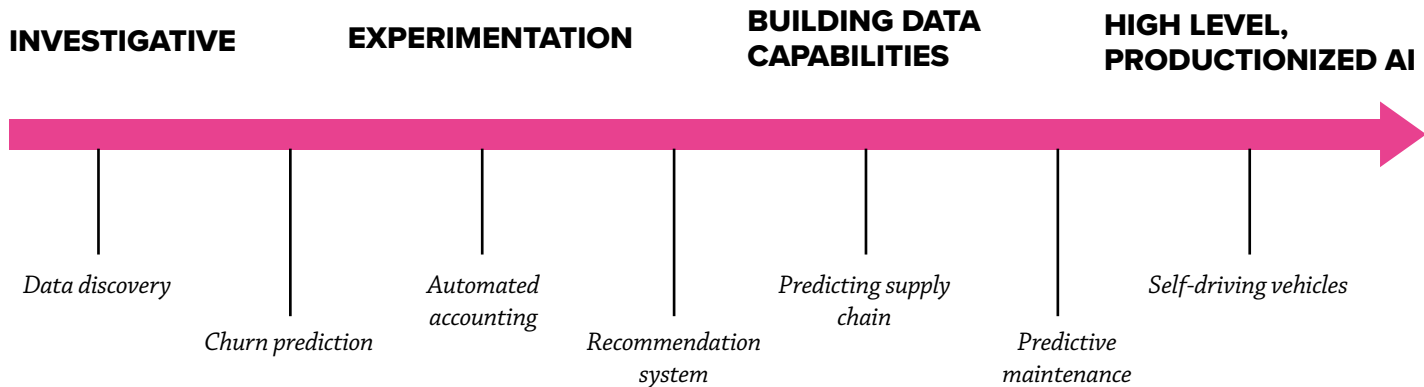
AI is not a new phenomenon, but the computing power required meant that it was prohibitively expensive for ordinary companies – until now. **With modern cloud tools and agile development methods, we can develop a business-shaping AI that scales to demand.** With the proper business case and right partner, you are now able to build AI-based solutions with a short-term payback on the investment.

Amount of dimensions

Human

Computer

Time spent on analysis

WHO BENEFITS FROM AI?

MARKETING

FINANCE

LOGISTICS

ECOMMERCE

IT

HR

SALES

OPERATIONS

SERVICE

= EVERYONE

SCOPE OF AI POSSIBILITIES

INVESTIGATIVE **EXPERIMENTATION** **BUILDING DATA CAPABILITIES** **HIGH LEVEL, PRODUCTIONIZED AI**

Data discovery

Churn prediction

Automated accounting

Recommendation system

Predicting supply chain

Predictive maintenance

Self-driving vehicles

The best cases for using AI are usually when humans cannot remember, or are too bored, lazy or slow, to make repetitive decisions or suggestions based on large datasets.

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TERMINOLOGY

Artificial intelligence is a somewhat generic term with a definition that depends on the case and speaker. In a broad sense, it can mean automatic problem-solving or decision-making by computers, often with the use of machine learning techniques. In a narrower, more common meaning, it means a human-like decision process made by a machine. We at Solita define artificial intelligence as a high-level term for a combined set of advanced analytics solutions.

Machine learning is a more specific term. It is a technical discipline that provides computers with the ability to learn from data observations without being explicitly programmed. The outcomes of the models can include classifications, estimates, alerts or trends. ML is best used in problems of high complexity, big data, multiple data sources and routine tasks.

Deep learning (deep neural networks) is a subcategory of machine learning where, instead of programming using code, the programming is done using models and data to develop a hierarchical, layered, analytical model. Often used in e.g. speech and image recognition.
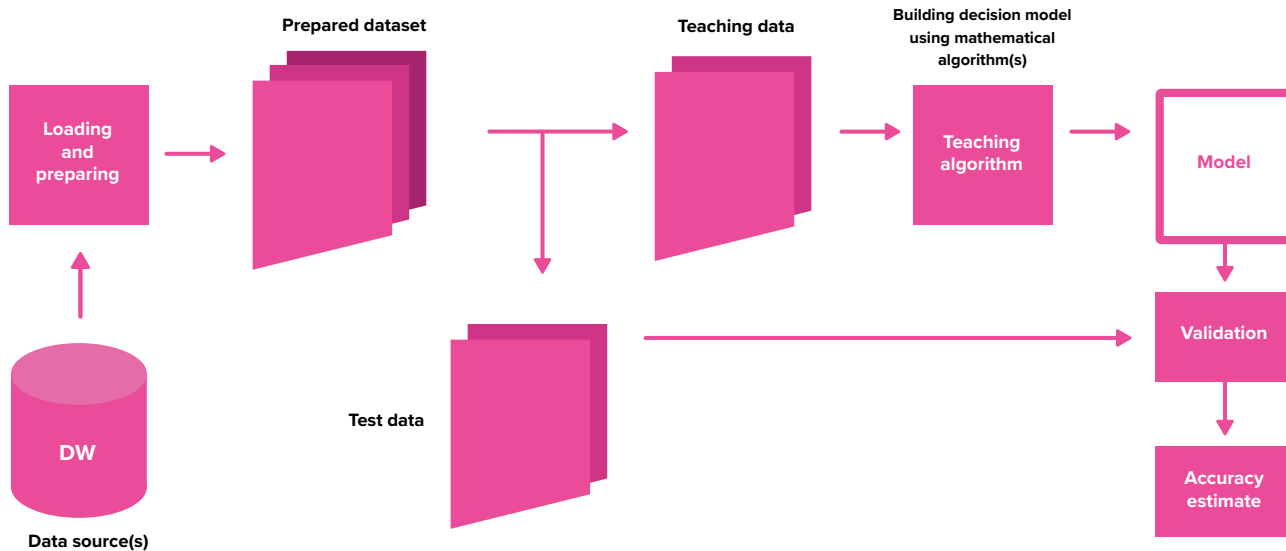
MACHINE LEARNING IN PRACTICE

ELEMENTS OF ML SOLUTIONS AND ORDER OF BUILDING

Machine learning is a subset of AI where the machine is trained to learn from it's past experience. The past experience is developed through the data collected. Then it combines with statistical models, ie. algorithms to deliver the final results.

10 PHASES OF MACHINE LEARNING:

1. *Data acquisition*
2. *Data quality assessment*
3. *Data pre-processing*
4. *Feature selection*
5. *Model selection*

6. *Model validation*
7. *Results*
8. *Conclusions*
9. *Recommendations*
10. *Future improvements*

HOW DO WE TEACH MACHINES?

Prepared dataset

Teaching data

Building decision model using mathematical algorithm(s)

Loading and preparing

Teaching algorithm

Model

DW

Data source(s)

Test data
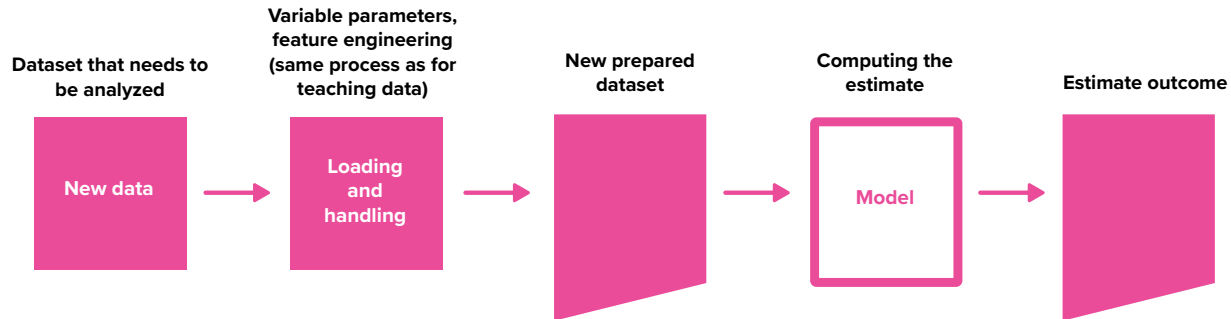
Validation

Accuracy estimate

Loading data into computing environment, data prepping (right format, variables, anonymization, clean-up/missing values, enriching, feature engineering)

Separation into teaching and testing sets (e.g. random sampling) so that the accuracy of the actual model can be validated.

The selected statistical model is parametrized against the business hypothesis. This is an iterative process, including several models/parameters to ensure the best fit.

1 2

ML SOLUTIONS IN PRODUCTION

Dataset that needs to be analyzed

Variable parameters, feature engineering (same process as for teaching data)

New prepared dataset

Computing the estimate

Estimate outcome

New data → **Loading and handling** → **Model** →

In production, a cloud computing server fetches the new data from source systems. Source systems can be websites, CRM systems or similar.

The preparation process is automated. The same actions are taken as with the training data.

Computing in real time or batches. The outcome can be visualized in publishing services or rules linked to other applications.

BEST
PRACTICES

STRATEGY & VISION

APPLIED SCIENCES

AI solutions often require expert knowledge. To partially solve this skill bottleneck, there is a rapidly growing market for new tools for business analysts, and automation in data platforms is increasingly letting data scientists concentrate on the most essential and complex work.

SERVICE DESIGN

AI applications should not be built in their own data science-focused silo. In addition to procuring the scientific skills, the best solutions come from multitalented teams of IT, data science and business people, created in an agile way, guided and constantly re-evaluated by service designers to ensure that true business value is achieved.

BUSINESS MODELS

Are you just digitizing the existing process, or could you reinvent your services? Never invest in AI without building a proper business case. This means first looking at the data, business model and customers, then asking the right questions to form a hypothesis to validate with an AI-based approach.

TECHNOLOGIES

The pace of innovation in the marketplace is increasing. All major vendors offer some AI solution. Data accessibility and preparation is the bigger bottleneck. The development cycle can be accelerated by making the data easily usable, and by automating and streamlining the basic ETL and data preparation work – especially crucial in real-time, data-intensive cases.

AGILE CULTURE   SCALABLE ENVIRONMENT

BEST PRACTICES

01   **BEGIN SMALL, DELIVER TO END USERS RIGHT FROM THE BEGINNING**
Usually an agile, iterative project model fits well with the explorative and experimental nature of applying science to business.

02   **ITERATE FROM "PLAN A" TO A "PLAN THAT WORKS"**
Prepare to rephrase and revalidate, to get the best model and accuracy for scaling to production.

03   **COOPERATE - THINK OUTSIDE THE BOX WITH A MULTITALENTED TEAM**
developing business worthy AI solutions requires a wide range of know-how from business domain, technology and analytics methods

START SMALL, EARLY FEASIBILITY

WRONG APPROACH
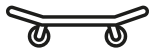**LATE REALISATION OF FEASIBILITY**

1   *2*   *3*   *4*

RIGHT APPROACH
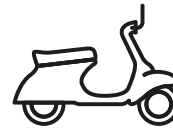**FEASIBILITY PROVEN EARLY**

1   *2*   *3*   *4*   *5*

BUY IT OR MAKE IT?

CUSTOM SOFTWARE:

+ Best solution for solid business case with high volumes
- Custom work may be expensive

MACHINE LEARNING AS A SERVICE:

+ Fast adoption, often good enough solution
+ Premade models are easy to use
- MLaaS solutions might cost a lot when scaled into production
- Generic solutions, not made for your business

PREMADE SOFTWARE PRODUCT:

+ Very fast time to production
+ Effectively solves one specific problem
- Generic solutions, not made for your business
- How do you integrate the software with the existing environment?
- Harder to adjust and understand the model's logic

CUSTOM

MLAAS

SOFTWARE

COMPLEXITY, POTENTIAL

1 8
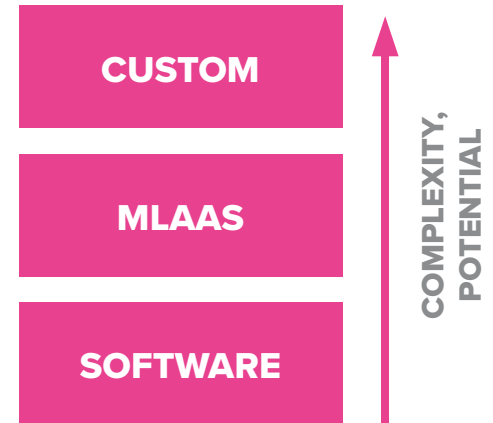
HOW TO PLAN AND EVALUATE

Solita's AI framework can be used to structure and evaluate AI use cases and their feasibility.

DATA SOURCES

- What data sources are available?
- Can the data be enriched with external data sources?

DATA PREPROCESSING AND FEATURES

- What kind of preprocessing is needed for the data?
- What kind of feature representations of the data could be useful?

BUSINESS VALUE AND IMPACT

- What is the value proposition?
- Does it have business value?
- What is the impact of the solution?
- What are the gains for the end user?

AI PROBLEM

- What is the problem we are trying to solve?
- What are the inputs and outputs?

PREDICTIONS

- What should be predicted or recommended?

DATA COLLECTION

- How is the data collected?
- What kind of data pipelines are needed?
- Real-time or batch processing?

DATA QUALITY

- What is the quality and nature of the data?
- Is there missing data?
- How accurate is the data?
- Does the data include outliers?

DECISIONS

- What decisions should be automated based on the prediction?

EVALUATE

- How is the result evaluated?
- What kind of metrics or key performance indicators are needed?
- Should the results be evaluated continuously?

MODELING

- What kind of models are needed?
- How is the model validated?
- How is the best model selected?
- Do we need to combine several models?

6 EXAMPLES OF USE CASES

1. SELF-DRIVING VEHICLES

SOLUTION AND APPLICATION TARGET

- Traveling and logistics as a service
- Cars, trucks, buses, trains, boats, drones, etc.

MAIN DATA SOURCES

- Video
- Sensor data
- GPS

BUSINESS VALUE GAINED

- Safer traffic
- Optimized traffic efficiency
- Saves time and money

TECHNOLOGY AND METHODS

- Computer vision
- Deep learning
- Machine learning
- Reinforcement learning

1. SELF-DRIVING VEHICLES

01 *Collect data from vehicles into a scalable storage and computing environment*

02 *Train deep neural network models with preprocessed and combined historical data to reach a predetermined destination*

03 *Deploy model to vehicles with specialized computing hardware integrated with sensors*

04 *Vehicles travel to destination along best route and speed determined by AI based on historical and real-time data*

05 *Collecting data from the fleet of vehicles and teaching the AI continuously allows the AI to adapt to new situations*

2. INFORMATION RETRIEVAL FROM IMAGES

SOLUTION AND APPLICATION TARGET

- Browse through tens of thousands of scanned images to automatically identify and store interesting text strings

MAIN DATA SOURCES

- Scanned images

BUSINESS VALUE GAINED

- Complete automation of large amounts of manual image inspection and data entry work

TECHNOLOGY AND METHODS

- Deep learning, convolutional neural networks
- Image processing techniques

2. INFORMATION RETRIEVAL FROM IMAGES

01 *Set up a secure and efficient cloud computing environment to effectively train deep neural networks*

02 *Train deep learning models to automatically identify interesting information from images*

03 *Finish the image processing pipeline by complementing the deep learning models with ordinary image processing techniques*

04 *Use the pipeline to automatically retrieve interesting information from tens of thousands of images*

3. PREDICTING SUPPLY CHAIN

SOLUTION AND APPLICATION TARGET

- Predict the item ratio of goods produced, sold-in and sold-through to end users

MAIN DATA SOURCES

- Sell-in data
- Possible transposed data
- Product registrations

BUSINESS VALUE GAINED

- Predict the sales
- Understand the state of supply chain

TECHNOLOGY AND METHODS

- Machine learning
- BI tools

3. PREDICTING SUPPLY CHAIN

01   *Collect item data from different points of the supply chain*

02   *Train models to predict the item's location in the supply chain*

03   *Report the status in easy-to-understand form and notify stake-holders about actions needed on demand*

04   *Predict the sales and optimize the manufacturing process based on items in the pipeline*

4. AUTOMATED ACCOUNTING

SOLUTION AND APPLICATION TARGET

- Automation of labour-intensive accounting tasks (e.g. manual inspection, invoice classification)

MAIN DATA SOURCES

- Accounting data (e.g. invoices, purchase orders)

BUSINESS VALUE GAINED

- Considerable decrease in manual work
- Frees time for higher-value work

TECHNOLOGY AND METHODS

- Basket analysis, association rules
- Deep learning also a possibility

4. AUTOMATED ACCOUNTING

01   *Collect correctly classified invoices from the accounting system*

02   *Enrich this data using e.g. a public business register*

03   *Train a machine learning model to correctly classify invoices based on available information*

04   *Apply the model to automatically classify new invoices without manual inspection*

5. RECOMMENDATION SYSTEM

SOLUTION AND APPLICATION TARGET

- Recommend next best action based on previous interactions

MAIN DATA SOURCES

- User data (e.g. CRM)
- Interaction data (e.g. sales)
- Online data

BUSINESS VALUE GAINED

- Increased revenue via cross-selling
- Better customer engagement

TECHNOLOGY AND METHODS

- Machine learning
- Collaborative and content filtering
- Rule mining / basket analysis

5. RECOMMENDATION SYSTEM

01 *Obtain a set of data, preferably vast, on e.g. customer purchases and/or ratings for products*

02 *Analyse the data in order to detect similarities/associations between products and/or customers (e.g. what movies are favoured by different users)*

03 *Using similarities/associations, build a recommendation algorithm or a model that provides one or more recommendation(s) based on input data (e.g. if a user likes romance and comedy films, recommend movies from those genres instead of horror films)*

04 *For a new customer, use the algorithm to recommend new products based on customer profile or other purchases*

6. PREDICTIVE MAINTENANCE

SOLUTION AND APPLICATION TARGET

- Outage prevention by using artificial intelligence to predict maintenance needs

MAIN DATA SOURCES

- Sensor data
- Consumption data
- Maintenance logs

BUSINESS VALUE GAINED

- Decreased maintenance costs
- Higher availability

TECHNOLOGY AND METHODS

- Signal processing
- Time series analysis
- Anomaly detection
- Change point detection

6. PREDICTIVE MAINTENANCE

01 *Obtain usage data from the device for training; if data before/during malfunctioning is available, training likely becomes easier. Such data might be e.g. device temperature measurements, enriched with the consumption data.*

02 *Process the measurement data into a more informative representation (aggregations, frequency domain transforms, time series models, etc.)*

03 *Train a model (or several models) to detect anomalies, changing trends, or otherwise different behaviour in the data. Maintenance log data can be used for evaluation.*

04 *Fine-tune the model(s) according to the business needs: is it more important to have a robust model with no false positive alerts, or to detect all possible malfunctioning, even if it would mean false alerts?*

05 *Apply the model for the data obtained from the device; if required, integrate with other systems that will produce alerts when the model suggests to.*

SUMMARY

AI offers every type of organisation smarter and more automated ways of doing business. The most important issues to address are:

01 **Understanding the data**

02 **Understanding the business**

03 **Understanding the end customer**

04 **Innovate - iterate - scale to production**

INTERESTED?

Solita's 600 experts can help you in every step of your journey, from business design and data, to agile development and modern scalable analytics platforms.

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USEFUL LINKS

https://www.solita.fi/en/customers/dna-data-platform-on-artificial-intelligence/

https://www.solita.fi/en/data-revolution-and-platform-economy-to-change-business/

https://www.solita.fi/en/blogs/what-are-the-benefits-of-real-time-analytics/

https://www.solita.fi/en/blogs/the-hiab-hackathon-a-recap-making-use-of-big-data/

https://www.solita.fi/en/blogs/is-your-future-business-based-on-robust-and-resilient-data-capability/