

Accelerating your research through Artificial Intelligence education

Over the past decade, artificial intelligence (AI) has gained substantial attraction in the medical field. Since 2012, the annual number of scientific publications on AI in medicine has multiplied by a factor of eight. This trend is driven by a staggering increase in (bio)medical data, such as multi-omics, image data, and digital electronic health records (EHRs), paralleled by an increase in computing power. To unlock the full potential of all this data and computing power, one needs AI. AI offers unique analysis strategies to accelerate your biomedical research, for example by finding patterns in large sets of data, extracting relevant relationships in a network of interdependent effects, or analyzing unstructured data such as image and text. Understanding how to use these new possibilities is a priority for all our top biomedical researchers! To support you, UMCG has partnered with REWIRE (an AI education company) to create a postgraduate education program aimed at professionals in medical research and pharma to get them to the next level. This program, called the *exquAiro* ('I discover using AI') AI & Data Bootcamp, was first launched in Q4 2023 with a 2x3-week intensive training aimed at our most talented researchers who want to take the next big step in applying AI in their biomedical research. The pilot program has been very well received (8,6 out of 10) and yielded many new research ideas and grant proposals that are currently under review for funding. Now, we are offering seats in the second class of this program, that will start on 7th of October 2024.

Why join the AI & Data Bootcamp

The AI & Data Bootcamp provides a unique opportunity to develop yourself further as a data professional, to accelerate your research using advanced analytical techniques and AI methods, as well as boosting your ability to inspire others with your research. Joining this program will provide you with the following:

- *Analyze complex data*
Analyze and leverage the new data sets present within the UMCG, such as single cell RNA-Seq and pharmacogenomics data
- *Benefit from a world standard in AI education*
Get training from field practitioners using the proven and accredited GAIIn learning method for AI education
- *Develop an integrated AI skillset*
Develop the broad skills to improve and accelerate medical research using AI by combining technical expertise with inspirational leadership
- *Learn new AI techniques*
Independently apply and interpret novel AI models and other analytical techniques to improve and accelerate your research

- *Join an AI network*
Build upon and leverage a network of AI pioneers within the UMCG, and from other institutions and industries
- *Develop your research vision and proposal*
Use everything learned to come up with innovative research ideas and translate these to new research grant proposals in co-creation with AI experts.
- *Benefit from exquAlro Funding*
Take advantage of the fact that exquAlro organizes funding for groundbreaking AI-centric medical research projects.

Setup of the AI & Data Bootcamp

Target audience

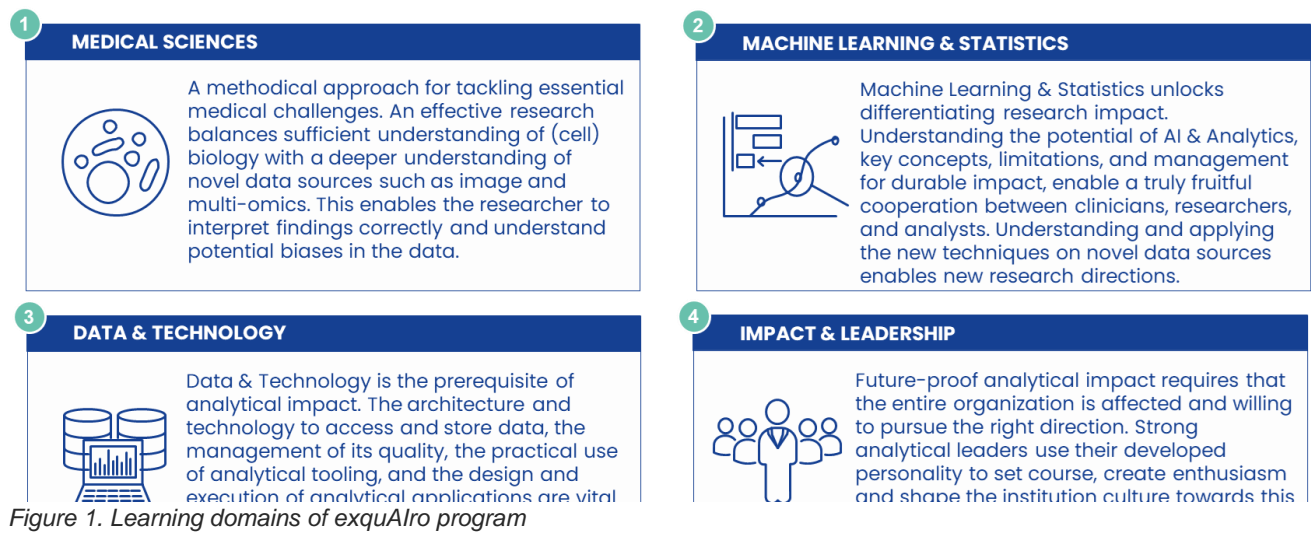
Participation in the AI & Data Bootcamp of exquAlro is targeted at aspiring data experts, researchers who want to get more out of their datasets, who want to build in-depth knowledge of the newest AI methods, develop world-class algorithms, and leverage new tech like cloud computing. With that, the bootcamp is targeted at the following audiences: staff members, junior tenure tracks and/or postdocs with interest and talent in data science. This can either be clinicians or basic scientists. There will be room for a maximum of 20 participants.

Requirements to join

Basic proficiency in data handling and coding is required to join the bootcamp. Online coding courses are suggested to participants to refresh their basic coding skills as part of the bootcamp pre-work. Previous hands-on experience with applying AI & ML in own research is no requirement. At the same time, participants are expected to have ambition after completing the program.

Curriculum and learning goals

The AI & Data Bootcamp will consist of two 3-week training blocks, taking place in October 2024 and January 2025. The Bootcamp is aimed at accelerating Data & AI Talents and training them in the 4-skill domains that are required to create impact with data and AI within the medical field:



labs for Responsible AI and DASH for Image Recognition and UMCG's AI tools. The other modules are modules on existing and proven GAI materials, taught by AI professionals.

Deepdive | Classification Using Tree Models

About the course

Classification problems account for 80% of the modeling challenges and we want to help you tackle these effectively with this badge. Tree-based learning is versatile and has a consistently high performance making it a valuable tool with endless applications. Consequently, this means there is also a staggering number of implementations available from these methods. In this practical course, you will learn to construct Decision Trees using Gini coefficients, combine them to maximize predictive power in a Random Forest and learn to apply, as well as interpret, powerful novel methods such as XGBoost. For each technique, you learn the criteria to determine whether a model is suited for your data and how to evaluate the results. After just two days, you will be prepared to implement tree-based models and handle various challenges of classification modeling.




Why this is for you

Do you want to implement advanced classification models, thereby creating a positive impact on your organization or research? The popularity of these methods brings with it a continuously

LEARNING GOALS & CONTENT

<p>Decision Tree</p> <p>Knowing when to use Decision Trees, how to construct one using Gini and being able to explain the theory behind them.</p>	<ul style="list-style-type: none"> Explanation of why and when to use tree classification techniques. Constructing a Decision Tree by determining the Gini-optimal splits in a small dataset. Explanation of CART and CHAID trees, including their pitfalls. <p>Case: Step by step building & challenging a Decision Tree.</p>
<p>Random Forest</p> <p>Successfully implementing the Random Forest classification technique and interpreting its results.</p>	<ul style="list-style-type: none"> Overview of the advantages of using bagging techniques. Framework for building a Random Forest. Assessing variable importance and the impact of adjusting Random Forest's hyperparameters. <p>Case: Step by step building & challenging a Random Forest.</p>
<p>AdaBoost (optional)</p> <p>Successfully implementing the AdaBoost classification technique and interpreting its results.</p>	<ul style="list-style-type: none"> Understanding the difference between bagging and boosting. Framework for building an AdaBoost tree. Assessing variable importance and the impact of adjusting AdaBoost's hyperparameters. <p>Case: Step by step building & challenging an AdaBoost model.</p>
<p>XGBoost</p> <p>Being able to explain the source of XGBoost's popularity and tailor this model to a particular dataset.</p>	<ul style="list-style-type: none"> The advantages of extreme gradient boosting methods. Framework for building an XGBoost model. Assessing variable importance and the impact of adjusting XGBoost's hyperparameters. <p>Case: Step by step building & challenging an XGBoost model.</p>
<p>Model Selection & Evaluation</p> <p>Choosing the appropriate classification method, based on their advantages, disadvantages and a selection of evaluation metrics.</p>	<ul style="list-style-type: none"> Overview of criteria to determine whether a model is suitable for your data. Selecting and running multiple models on your data, whilst assessing the pros and cons of each model. <p>Case: Evaluating multiple models based on a chosen metric.</p>

TRAINING SETUP

 Duration: 2 days								
 Certification level: Badge 3202								
 Pre-requisite: 3201 (recommended)								
Course Outline								
<table border="1"> <thead> <tr> <th>Day 1</th> <th>Day 2</th> </tr> </thead> <tbody> <tr> <td>Decision Tree</td> <td rowspan="2">XGBoost</td> </tr> <tr> <td>Random Forest</td> </tr> <tr> <td>Random Forest</td> <td rowspan="2">Model Selection</td> </tr> <tr> <td>AdaBoost</td> </tr> </tbody> </table>	Day 1	Day 2	Decision Tree	XGBoost	Random Forest	Random Forest	Model Selection	AdaBoost
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AdaBoost								

increasing number of similar techniques and a mass of often unreliable online resources, and the question is which one to use. Classification using tree models will allow you to grasp the potential of tree-based models by steering you through the endless content and opinions to find tried methods that can immediately be applied to your research.

Detailed learnings goals and content

Deepdive | Programming Meta-Skills

About the course

This one-day badge focused on code, teaches you how to efficiently produce high-quality code, while working together with a team on a shared codebase. This training provides you with three competencies:

1. Writing code with a team, meaning you can share and version your code using Git.
2. Writing understandable and clean code that is properly structured and therefore easily understood by other developers.
3. Writing low maintenance code by implementing error handling, logging and unit tests.

Why this is for you




To work efficiently in an environment where data analytics and AI have an increasingly important role, everyone who works with the data, AI models, or writes the engineering code for it, should be able to write code that ideally does not break. But even if it does, it should be easy to debug (by others) because the code is well structured and therefore easy to understand. Naturally, all this should be versioned in Git. In this course, our field experts will teach you how to program efficiently, so that your code is maintainable, easily understandable, and versioned with Git in such a way that new models, features or data connections can be added easily and safely.

Detailed learnings goals and content

LEARNING GOALS & CONTENT

<p>Writing code with a team</p> <p>Learn how to efficiently work together using version control and code reviews in Git</p>	<ul style="list-style-type: none">• Learn how to share your code within the team using version control, we will be teaching Git (used by more than 80% of development teams worldwide). We will discuss the most important Git commands, using them to solve specific situations• Within a team, code reviews are essential for sharing knowledge and guaranteeing quality of code. You will learn how to execute them and resolve potential merge conflicts, so that your code will run flawlessly in production
<p>Writing understandable and clean code</p> <p>Learn how to write you code so that it adheres to governing coding standards and is easily understood by others</p>	<ul style="list-style-type: none">• By adhering to certain industry standards for formatting your code and naming your variables, you ensure that your code is readable and easily understood by others.• You will learn how to properly style your code and write consistent documentation
<p>Writing low maintenance code</p> <p>Learn how to write your code so that it "just works" and avoid pitfalls such as having no idea what your code is doing in production</p>	<ul style="list-style-type: none">• You want your code to run perfectly in production. By implementing a reliable process that tests the functionalities of your code, you ensure a high quality of your code.• If you add new features, you want them to be able to deal with all kinds of circumstances. Several functionalities, such as error handling, logging and unit testing can help a great deal in this process.

TRAINING SETUP

-  Duration: 1 days
-  Certification level: Practitioner
-  None

Course outline

Day 1

Writing code with a team

Writing understandable and clean code

Writing low maintenance code

Deepdive | Data-Driven Communication

About the course

Getting your message across can be challenging when dealing with complex analytical content. It can be hard to formulate communication in an effective and comprehensible way, such that your audience walks away with the message you intended to convey. In this two-day badge, you will learn to structure your storyline using the pyramid principle and support your message by choosing the right analytical visualizations. This course will incorporate key theoretical principles of structured storylining and powerful visualization. We focus on why these principles are important and how you can apply them in your own work.

Why this is for you



Have you ever felt that your presentation didn't quite get your intended message across? Or perhaps your delivery of analytical content was over-complicated? This course is designed for you! We will provide you with the tips, tricks, and confidence to master these skills and create an impact with your work.

Detailed learnings goals and content

LEARNING GOALS & CONTENT

Bringing your message across By using the Pyramid Principle	<ul style="list-style-type: none">• Introduction to the Pyramid Principle• Three reasons why the Pyramid Principle works• The importance of a main message and related main arguments• Case: formulate a main message and main arguments for your own presentation
Creating a storyboard Storyboarding method to create pyramid proof stories	<ul style="list-style-type: none">• Introduction to the storyboarding method – a storylining framework• The importance of defining your audience, goal, and setting• Introduce your story using Situation, Complication, Question set-up• Support your story with data-driven evidence• Case: create a storyboard for own presentation
Presenting a pyramid proof story Presenting your story in a way that is easy to follow	<ul style="list-style-type: none">• How the Pyramid Principle can be used as a guideline for presentations• Presenting your story in a way that is easy to follow• The importance of a good introduction
Supporting your message with powerful visualizations Why visualization is important to bring your message across	<ul style="list-style-type: none">• Information processing: understand why visualization is important to bring your message across• Understand how you can guide your audience through your slides• Inspire with visualization do's and don'ts• Case: improve your own slides
Choosing the right graph Visualizing quantitative information	<ul style="list-style-type: none">• Understand the different types of analyses and how they require different graphs• Use the graph chooser to select the correct graph for your analysis• Increase speed in making slides and graphs in PowerPoint• Case: improve your own graphs

TRAINING SETUP

-  Duration: 2 days
-  Certification level: Business Practitioner
-  Pre-requisite: AI Foundation

Course outline

Day 1	Day 2
Bringing your message across	Supporting your message with powerful visualizations
Creating a storyboard	Choosing the right graph
Presenting a pyramid proof story	

The exquAiro foundation

Over the past four years, the UMCG has been working closely together with AI & Data firm REWIRE to deliver cutting-edge research. This cross-border journey has revealed the potential and learning need for innovative artificial intelligence (AI) techniques for medical research, which formed the basis for a new AI institute for education and research: exquAiro. ExquAiro aims to accelerate medical breakthroughs with AI, both through education in the field of AI and supporting the funding of AI research in medical science. exquAiro is a public-private collaboration initiative and a not-for-profit foundation.

Creating a new open standard for AI education in pharma and medical research

We aim to fulfill the increasing demand for AI expertise in the (bio)medical field by launching a new standard for Artificial Intelligence (AI) education, specifically tailored to the biggest opportunities in the (bio)medical field, such as applying Machine Learning on Multi-Omics data, modelling Complex Systems with Bayesian Networks and applying Image Recognition techniques for Pathology. Launching this initiative as an open standard will enable us to radically scale it by creating a network of educational institutions applying the same successful educational formula.

Funding cutting-edge medical research projects that create breakthroughs

The after-cost remains of participation fees from the education programs will be used to fund multidisciplinary AI research in the medical field at UMCG. The collaboration between UMCG and REWIRE has shown that such collaboration innovates and pushes research further. Collaborating on the interface of AI and biomedical research unlocks the opportunities within new multi-omics and image datasets but requires a deep knowledge of AI-driven methods and techniques. The funding will be assigned to high-impact research projects by the board of the foundation, where UMCG holds the final vote.

Combining education and research will generate synergies between both purposes. Education is inspired by funded research and taught by field practitioners. At the same time, the education will enable researchers to accelerate their own research.

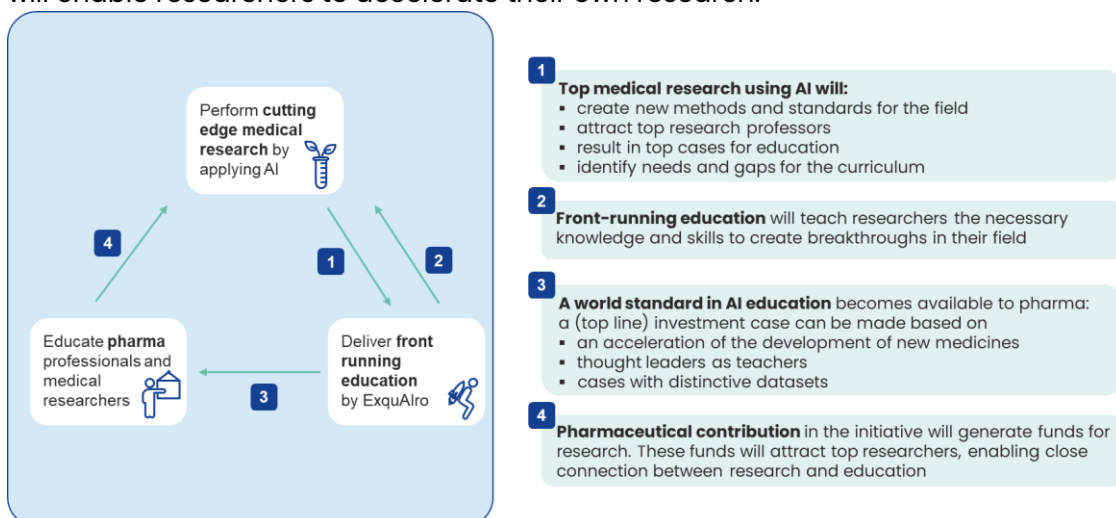


Figure 3. The exquAiro philosophy