ardigen

Artificial Intelligence & Bioinformatics
for Precision Medicine

Digital CRO

in the era of Artificial Intelligence

Digital CRO

> *The digital CRO team brings together scientists and engineers with diverse skill sets, ranging from biology and chemistry to statistics and machine learning. We work with both small startups and big pharmas to leverage digital power in order to enable the development of new therapies. We contribute to the entire drug discovery process, from target identification and validation, to compound design and clinical trials. We make bioinformatic workflows and software with human-readable code, as well as machine learning models that "understand" biological data and provide cutting-edge solutions for Precision Medicine.*

Łukasz Nowak, *COO, General Director of Digital CRO Unit*

Key competencies

DIGITAL CRO

Bioinformatics

- Integrative multi-omics
- Small and long non-coding RNA
- Preclinical and clinical data
- Biomarker discovery
- CRISPR
- Ribo-Seq
- Single cell
- Big data expertise
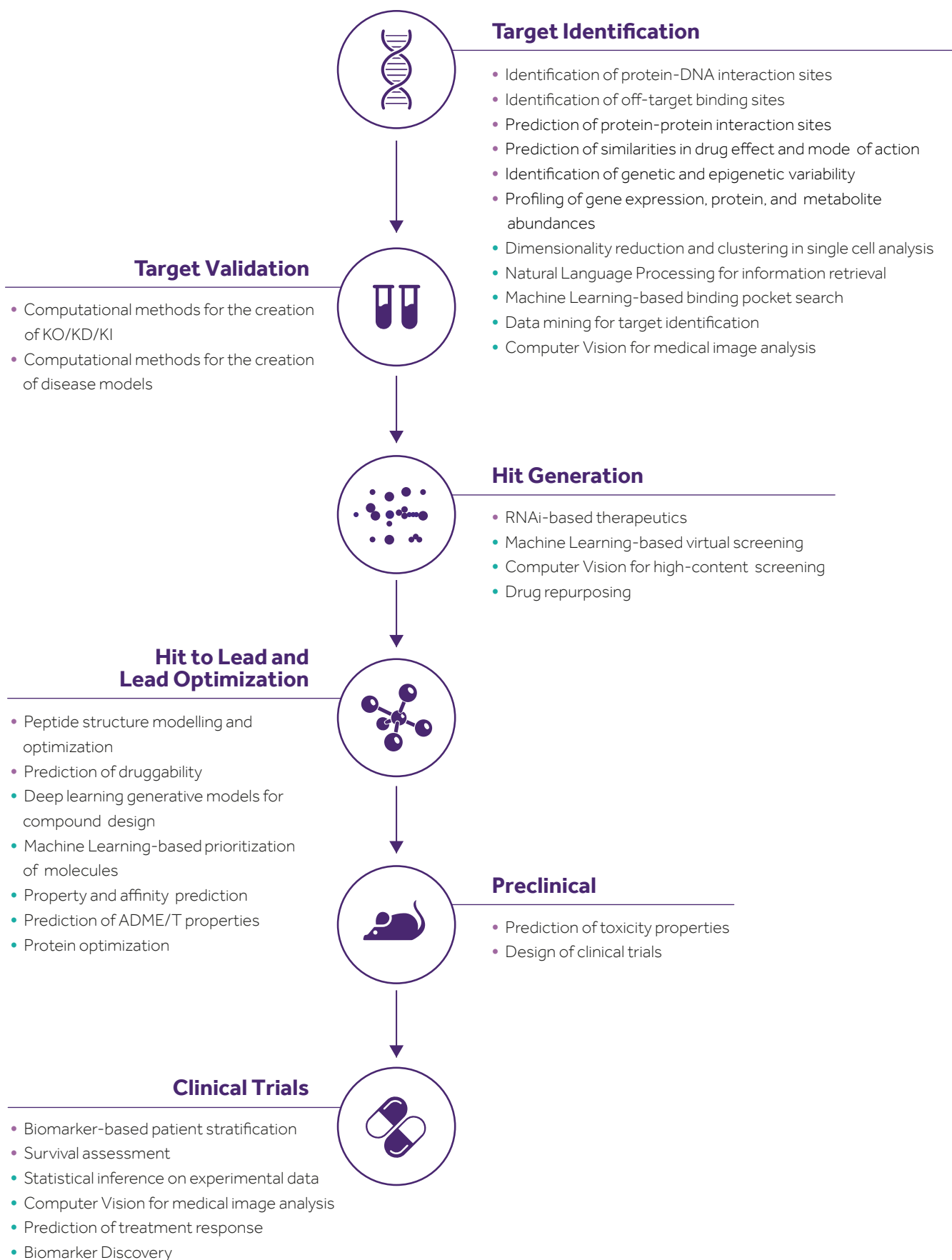
AI / Data Science

- Custom R&D projects
- Computer vision
- Compound design
- Protein optimization
- Biomarker discovery
- Natural language processing
- Inference & prediction
- Explainable AI (XAI)

Software Engineering

- Custom pipelines
- Data visualization
- Database design
- Cloud native systems
- End-to-end systems
- MLOps, Docker & Kubernetes
- Performance tuning
- FDA & HIPAA compliance

Examples of projects in Drug Discovery and Development

Target Identification

- Identification of protein-DNA interaction sites
- Identification of off-target binding sites
- Prediction of protein-protein interaction sites
- Prediction of similarities in drug effect and mode of action
- Identification of genetic and epigenetic variability
- Profiling of gene expression, protein, and metabolite abundances
- Dimensionality reduction and clustering in single cell analysis
- Natural Language Processing for information retrieval
- Machine Learning-based binding pocket search
- Data mining for target identification
- Computer Vision for medical image analysis

Target Validation

- Computational methods for the creation of KO/KD/KI
- Computational methods for the creation of disease models

Hit Generation

- RNAi-based therapeutics
- Machine Learning-based virtual screening
- Computer Vision for high-content screening
- Drug repurposing

Hit to Lead and Lead Optimization

- Peptide structure modelling and optimization
- Prediction of druggability
- Deep learning generative models for compound design
- Machine Learning-based prioritization of molecules
- Property and affinity prediction
- Prediction of ADME/T properties
- Protein optimization

Preclinical

- Prediction of toxicity properties
- Design of clinical trials

Clinical Trials

- Biomarker-based patient stratification
- Survival assessment
- Statistical inference on experimental data
- Computer Vision for medical image analysis
- Prediction of treatment response
- Biomarker Discovery

Bioinformatics

The application of computational methods to life sciences has provided tremendous progress towards the understanding of biological systems, with a particular impact on areas generating vast amounts of data (e.g. genomics). For example, in silico methods enabling more thorough data analysis, creation of data libraries for a particular study type (e.g. gRNA libraries for CRISPR experiments), or discovery of novel relationships (e.g. biomarkers for a specific disease).

WHAT DISTINGUISHES US:

- Access to and integration of data from key online resources for data enrichment and comparison
- Expertise in cost-effective local and cloud -based solutions
- Dedicated Data Office support ensuring the highest data quality:
  - data search/screening, access, curation, and transfer
  - licensing evaluation
  - application process support

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> *We pride ourselves in hiring the best bioinformaticians from top institutions who have abroad domain knowledge and expertise in creating best-in-class solutions. Our skilled software engineers support them byensuring the most efficacious solutions - robust, scalable, automated, flexible, and easy to share.*
>
> **Marek Piatek, PhD,** *Director of Bioinformatics*
>
> "

Organism - level

- Identification and characterization of genetic variants
- Prediction of variants' functional consequence
- Analysis of disease association
- Comparison of variants across populations
- Visualization of variants at genome or chromosome level
- Meta-analysis of genome-wide association data

genomic mapping

variants distribution

disease association likelihood

population-based association

variants functional consequence

POPULATION COMPARISON
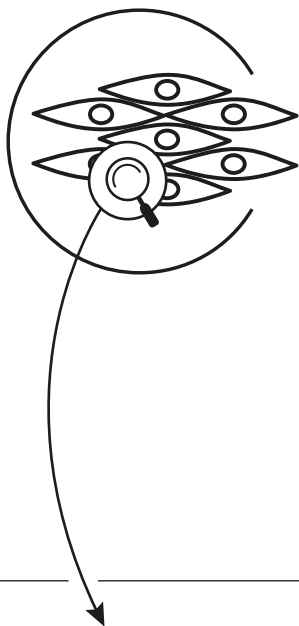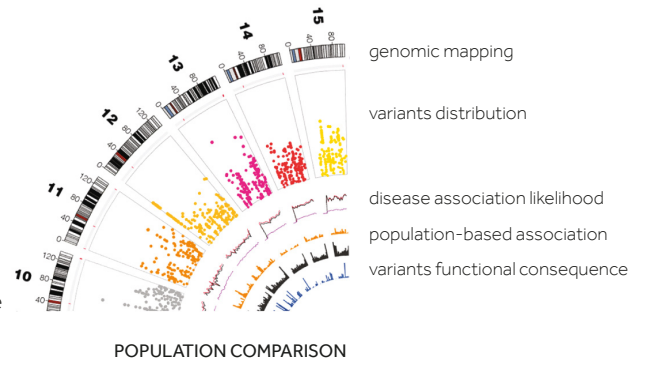
Tissue - level

- Comparison of tumor with healthy tissue
- Quantification of a sample's purity
- Characterization of tumor microenvironment heterogeneity
- Identification and characterization of tumor subgroups

ACC

HEALTHY vs. DISEASE

TUMOR

TUMOR MICROENVIRONMENT
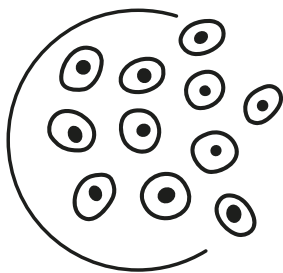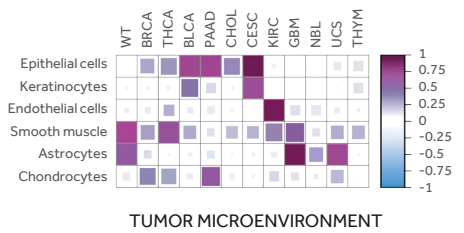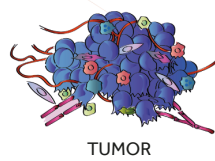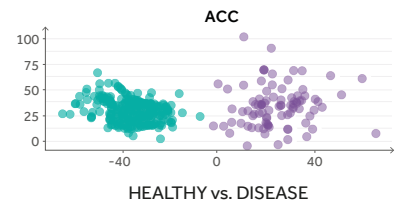
Single cell - level

- Genomics and transcriptomics at cell-level resolution
- Identification of rare cell types/subtypes
- Capturing cell state transition
- Integrative multi-modal analysis
- Spatial analysis
- Multiple technologies and protocols

SINGLE CELL PROFILING - GENOME AND TRANSCRIPTOME
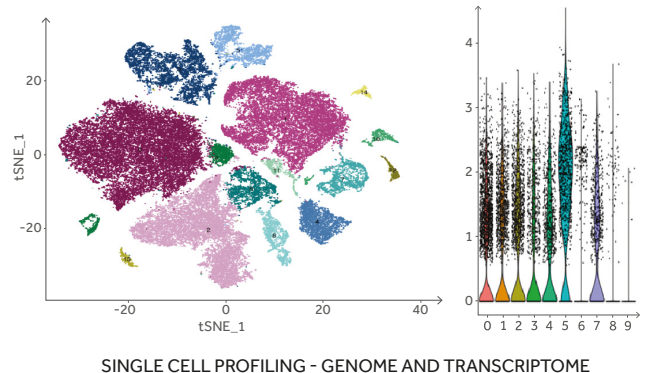
SEE OUR EXAMPLE PROJECTS ⟫⟫⟫

AI / Data Science

Advancements in Artificial Intelligence have a great impact on every industry. Such advancements concerning Machine Learning have a track record of improving research and product development in Life Sciences. It enables us to push the limits of contemporary data analysis by leveraging advanced algorithms for inference and prediction. It also provides a way of gaining previously unattainable insights, using a fraction of the time and resources.

WHAT DISTINGUISHES US:

- A world-class team made up of data scientists focused on Life Sciences
- We are among the top-performing teams in various machine learning competitions worldwide such as the DREAM Proteogenomics Challenge
- Strong collaborations with renowned academic groups on cutting-edge research projects
- Experience in working closely with domain experts, also in-house (e.g. biologists, immunologists, medicinal chemists, pathologists)
- We are among the world's top 30 AI Companies in Healthcare and Drug Discovery

The application of AI can significantly improve the drug discovery process. We contribute to this technological revolution by creating value for our partners. To this end, we provide actionable results and tools that accelerate the development of assets.

**Jan Kaczmarczyk, PhD,** *Director of AI & Data Science*
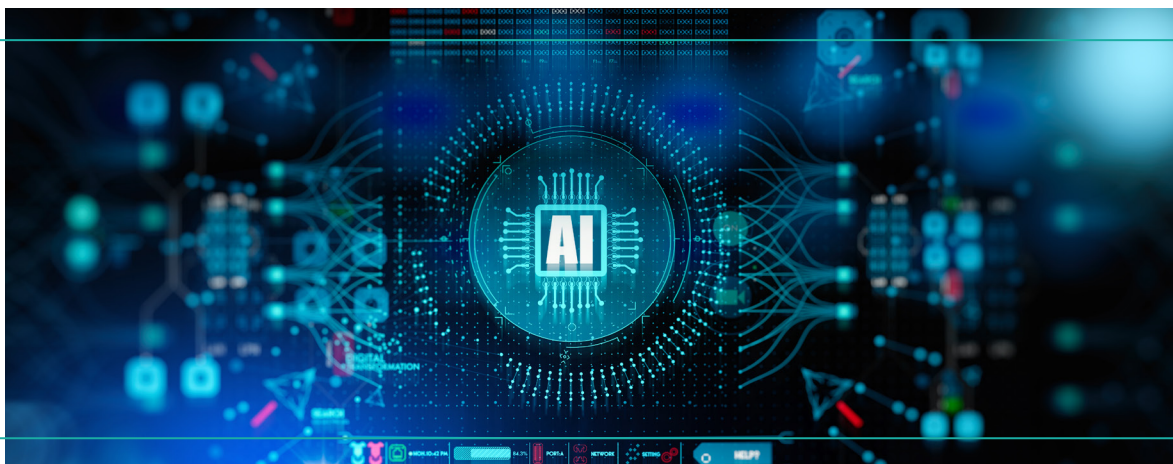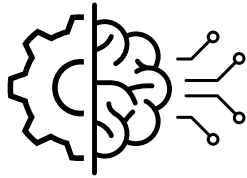
AI in Custom R&D Projects

- Custom methods leveraging AI/Data Science in your challenging R&D projects
- Broad applications: Biomarker Discovery, NLP for knowledge extraction, MLOps for production and experimental AI pipelines, etc.
- Research in collaboration with renowned academic groups on development and application of novel deep learning methods (adversarial networks, semi-supervised learning, graph-representation learning, etc.)
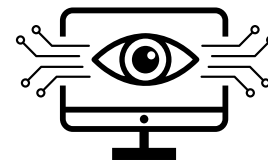
Computer Vision

- Advanced Computer Vision pipelines with diverse applications in biomedical imaging
- Automated assessment of pathological changes outperforming human experts
- High-content phenotypic screening (HCS) with superior image-based compound fingerprints
- Robust image processing aimed at improving prediction properties
- Interpretability, quality control, automatic segmentation of tissues
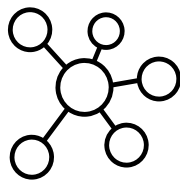
Compound Design

- In-house COPTIC technology for molecule property prediction and optimization
- Based on cutting-edge research (presented at NeurIPS 2019 and 2020)
- Validated in vitro
- Flexible (custom rules and constraints on the chemical space)
- Augments your medicinal chemists' efforts with quick iterations
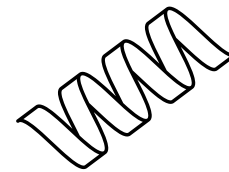
Protein Optimization

- Custom solutions based on our PRISM technology
- Works with any protein type to address your specific challenges
- Protein property prediction and optimization for properties, such as binding, stability, immunogenicity, interactions, etc.
- Suggests changes in the amino-acid sequence with custom constraints
- Collaboration scenarios tailored for your needs (optimization iterations and/or web application for cloud computing)

SEE OUR EXAMPLE PROJECTS ⟩⟩⟩

Software Engineering

In today's world, perfect technical execution of any project is a prerequisite for success. We are a battle-tested team with over a hundred completed projects for customers, ranging from startups to top big pharmaceutical companies. Our solutions are used by teams from academic backgrounds to Nasdaq listed companies. We understand more than just information technology. Ardigen's diverse team brings together engineers with backgrounds in biology, chemistry, statistics, and machine learning. We have also been utilizing top-of-the-line tools for a wide array of applications, including: NGS, proteomics,metabolomics, and metagenomics to name a few. Using modern technology stack, we can deliver complete solutions while keeping expenses minimal.

WHAT DISTINGUISHES US:

- IT training for bioinformaticians
- Certified cloud specialists
- Contributions to open-source projects
- Collaborations with academia and industry
- Modern technology stack

> *We are experienced in research but focused on business. Our team has a track record of over 150 successful projects. We have vast experience in building and optimizing bioinformatic solutions for the cloud and on-prem. We speak the language of biology and understand more than just information technology.*
>
> **Piotr Radkowski,** *Director of Software Engineering*
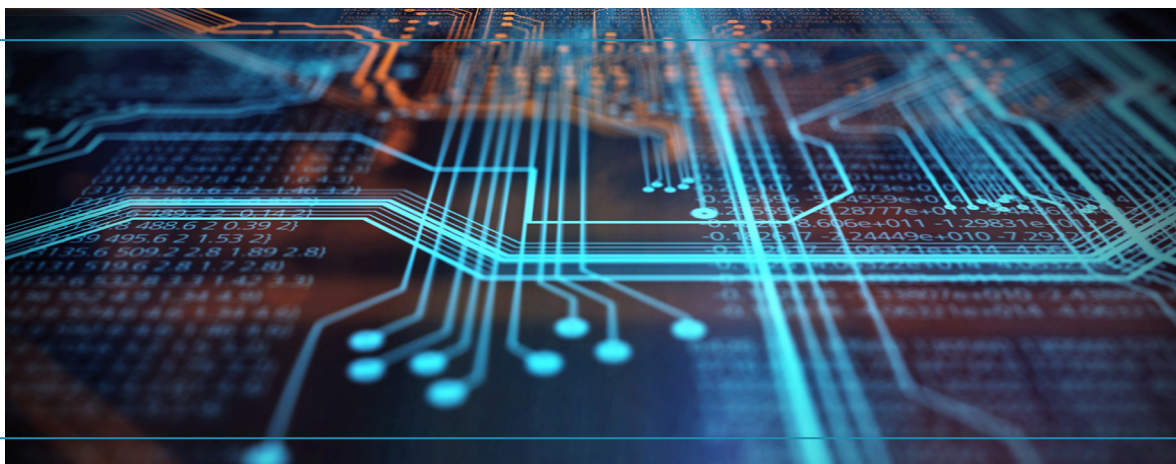
Data-driven solutions & DataOps

- Design, implementation, and tuning of data processing algorithms
- Custom tools for data processing and visualization
- Design and tuning of domain specific databases
- Data lakes and FAIR experimental data management systems

Custom pipelines

- Large scale, automated production pipelines for RNA-Seq, DNA-Seq, single cell, etc.
- Robust research oriented pipelines
- Pipeline benchmarking and optimization
- High quality and reproducible pipelines

Cloud native systems, DevOps & MLOps

- Kubernetes and Docker-based solutions
- Serverless architectures and microservice-based systems
- MLOps for production and experimental machine learning pipelines
- Cloud based and hybrid systems maintenance and cost optimization
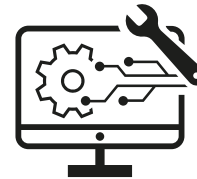
End-to-end systems development and maintenance

- Technical consulting, systems integration and migration of legacy solutions
- Technical support and maintenance
- User interface and user experience (UX) design
- Security and legal compliance - FDA, HIPAA, HITECH, CLIA
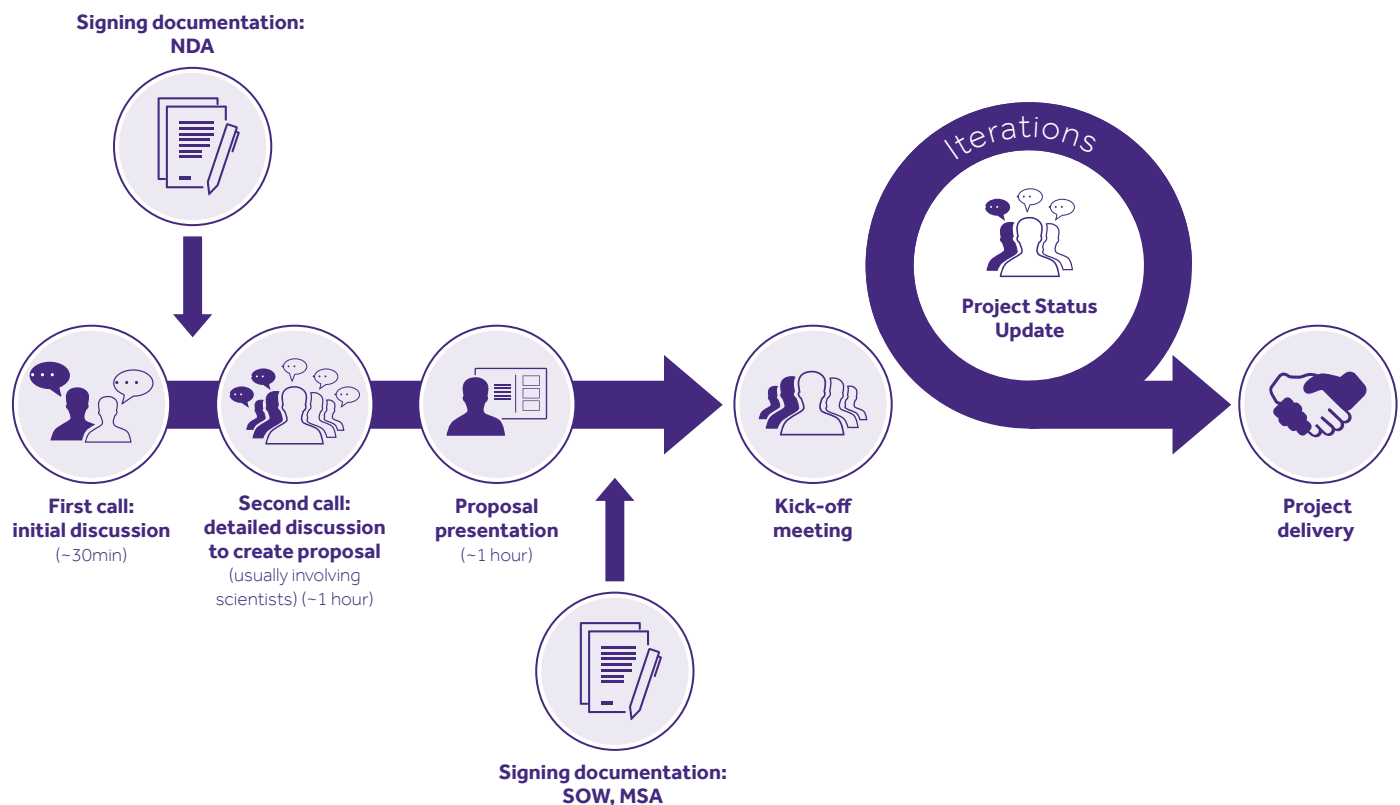
SEE OUR EXAMPLE PROJECTS ≫

Business models

How do we work?

- We focus on partnering, we have a collaborative attitude and establishing long term relationships is our goal
- Working globally across different time zones and customer types

- Agile approach*
- T&M/FTE and other business models available

*** Agile methodology** - method of working with a client, ensuring single point of contact, work in iterations, and full transparency.

How we collaborate with clients:

Signing documentation: NDA

First call: initial discussion (~30min)

Second call: detailed discussion to create proposal (usually involving scientists) (~1 hour)

Proposal presentation (~1 hour)

Signing documentation: SOW, MSA

Kick-off meeting

Iterations

Project Status Update

Project delivery

What do we offer?

- Truly customizable solutions
- Unique blend of skills with strong biology expertise
- Experience with public, proprietary, and licenced datasets

- Strong software engineering support for best performance
- Proven expertise with awards in prestigious scientific competitions

Testimonials

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We at Targovax have been impressed and delighted with Ardigen's expertise, professional attitude, attention to details and flexibility. We also highly value their individual approach when working with clients, and last but not least, their result delivery is on time. Generated results represent a key component of our clinical pipeline readouts.

Lukasz Kuryk, PhD
Director, Clinical Science at Targovax

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Working with Ardigen has enabled us to apply precision bioinformatics and machine learning to our most pressing problems.

Andrew Greenstein, PhD
Director, Translational Science, Corcept Therapeutics

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The PRISM pipeline has dramatically improved our discovery efforts and uncovered new unexpected lead candidates. In addition, the deployment on cloud computing resources has allowed our discovery team to explore possibilities that would be untenable under traditional settings.

Pawel Fludzinski, PhD
CEO, AmideBio

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We've been delighted with the exceptional results Ardigen has delivered. As the developer of AbGenesis, the world's leading antibody repertoire analysis platform. I can see first-hand how the scale and prevalence of NGS in antibody discovery and immune monitoring presents challenges for computational platforms.
AbGenesis needs to be able to analyse anything from 1 sequence to 1 billion. Our strategic partnership with Ardigen has enabled us to not only keep pace with, but vastly exceed the expectations of our diverse and rapidly expanding user base of over 40 major pharmas and biotechs.

Chris Smith, *CTO Distributed Bio*
South San Francisco, USA

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ardigen

Artificial Intelligence & Bioinformatics
for Precision Medicine

IMMUNOLOGY
Immunity by design
with Artificial Intelligence

- pMHC target identification
- Off-target toxicity prediction
- TCR-based therapies
- Cancer vaccines

MICROBIOME
Decoding the microbiome
with Artificial Intelligence

- Biomarkers
- Function Discovery
- Microbiome target identification
- Microbiome signatures

BIOMEDICAL IMAGING
Extract more from images
to drive drug discovery

- Image-based profiling
- Predictive phenotypic signatures
- Image-based biomarkers
- Novel clinical endpoints

DIGITAL CRO
Digital Drug Discovery
in the era of Artificial Intelligence

- Bioinformatics
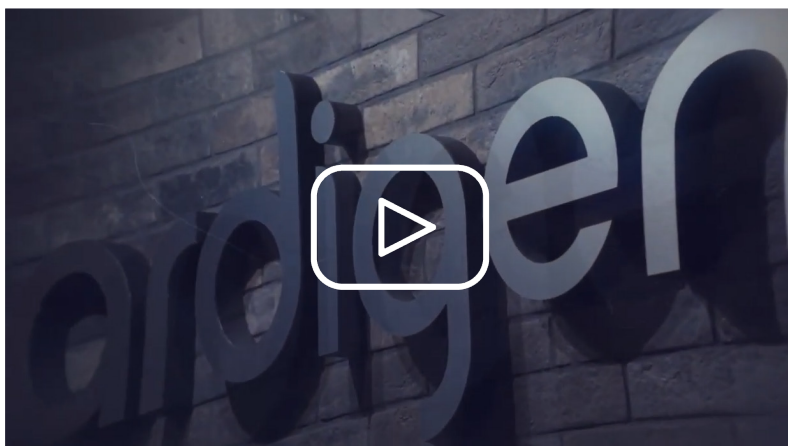- AI / Data Science
- Software Engineering

180+
COMPLETED PROJECTS

45+
CUSTOMERS

110+
EMPLOYEES

One of the **Top 30** leading
AI Drug Discovery companies
in the world*

* according to the Deep Knowledge Analytics' report
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