

# Knowledge Democratization

with an Enterprise Knowledge Graph  
at Boehringer Ingelheim



*Empowering domain experts with a seamless experience  
over interconnected use case specific and use case  
agnostic knowledge graph applications*



## THE CUSTOMER

Boehringer Ingelheim is working on breakthrough therapies that transform lives, today and for generations to come. As a leading research-driven biopharmaceutical company, the company creates value through innovation in areas of high unmet medical need. Founded in 1885 and family-owned ever since, Boehringer Ingelheim takes a long-term perspective. More than 52,000 employees serve over 130 markets in the three business areas, Human Pharma, Animal Health, and Biopharmaceutical Contract Manufacturing. In order to manage their constantly growing data and to gain new insights, Boehringer Ingelheim started the dataland program.

### dataland – Main Goals

- Build a data-centric culture at Boehringer Ingelheim
- Implement technical systems needed to tackle data management challenges

## THE CHALLENGES

### Constant data growth

- » New data is generated by new studies, new research and new analyses

### Siloed data handling

- » Data is handled differently and within their own systems at each stage in the drug development pipeline

### Limited data reuse

- » Each use case generates new data without data reuse



## THE KNOWLEDGE GRAPH SOLUTION

### Semantic model defined together with business

- » The model captures domain-relevant concepts and relations Data references the semantic model directly

### Explicit links with global identifiers

- » Identifiers are globally unique and describe the data access protocol

### Federation across data silos

- » Multiple data silos and knowledge graphs can be accessed and interlinked using the SPARQL standard

*Data scientists, data analysts, and researchers spend their time on bringing data together for data analysis or for answering specific business questions. Each use case basically generates new data without data reuse.*

### Maksim Kolchin,

Knowledge Graph Platform Lead,  
Boehringer Ingelheim



### Flexible and extensible data model

- » The graph data model can be extended while improving data
- » New data can be ingested before explicitly defining the semantic model

### Data virtualization

- » Tabular data outside of the knowledge graph can be mapped to the graph model





# Linked data exploration

- » metaphactory enables end users to access and consume data across heterogeneous data silos without boundaries
- » The Boehringer Ingelheim Linked Data Explorer powered by metaphactory provides interactive knowledge discovery and search interfaces that support use case specific interaction patterns

*Building custom applications with metaphactory for our use cases was easy without too much effort or resources required.*

**Maksim Kolchin,**  
Knowledge Graph Platform Lead,  
Boehringer Ingelheim



retinopathy

Sample (13) Study (27) x Indication (4) Therapeutic Area (1) Specimen (0)

Specimen origin

hasSpecies: Homo sapiens

Found 15 Results

Matching Studies

Selected 0 items

With selected...

Group columns

Study	Responsible Site	Therapeutic Area	Indication	Tissue
Diabetic Retinopathy Endothelial Cells GSE94019 Lam 2017 (GEO) (1)	Boehringer Ingelheim, Biberach, Germany	CMDR	Diabetic Retinopathy	
Human AMD Retina Lvu 2021 (GEO) (8)	Boehringer Ingelheim, Biberach, Germany	CMDR	Retinopathy	4 values
Human RPE Mt Sinal (1)	Boehringer Ingelheim, Biberach, Germany	CMDR	Diabetic Retinopathy	
Human RPE Primary Cells (1)	Boehringer Ingelheim, Biberach, Germany	CMDR	Diabetic Retinopathy	
Human Retina AMD GSE115828 Ratnapriya 2019 (GEO) (1)	Boehringer Ingelheim, Biberach, Germany	CMDR	Diabetic Retinopathy	Retina
Human Retina AMD GSE115828 Ratnapriya 2019 (GEO) (1)	Boehringer Ingelheim, Biberach, Germany	CMDR	Diabetic Retinopathy	Retina
LXR agonism in RPE cultures (1)	Boehringer Ingelheim, Biberach, Germany	CMDR	Retinopathy	
Peripheral Retina and RPE Choroid AMD vs. Control Kim 2018 GSE99248 (GEO) (4)	Boehringer Ingelheim, Biberach, Germany	CMDR	Diabetic Retinopathy	4 values
Retina Diabetic Retinopathy and DME (IOWA) (14)	Boehringer Ingelheim, Biberach, Germany	CMDR	Diabetic Retinopathy, Diabetic Macular Edema	Macula Lutea, Peripheral Part of Retina
Retina and RPE Diabetic Retinopathy (BBC) (2)	Boehringer Ingelheim, Biberach, Germany	CMDR	Diabetic Retinopathy	Retina, Pigmented Layer of Retina

Result Set Statistics

Top 10 Correlations

hasSpecimenDisease [CRN Concept]

Values

Bar chart showing values for various categories: Normal, Unknown, Age Related Macular D., Diabetic Retinopathy, Type 2 Diabetes Mellitus, Early age related macul., Diabetic Macular Edema, Wet Macular Degener., Non-proliferative Diab., Dry age related macula.

bio

Sample (0) Study (3) x Indication (2) Therapeutic Area (0) Date (0) Specimen (0) Sex (0) Ethnicity (0) Tissue (1)

Specimen origin

hasSampleStrandedness: Reverse

Found 2 Results

Matching Studies

Selected 0 items

With selected...

Group columns

Reset table settings

Study	Responsible Site	Therapeutic Area	Indication	Tissue
Effect of nintedanib on biomarkers (1)	Boehringer Ingelheim, Biberach, Germany	ISR	Idiopathic Pulmonary Fibrosis	Blood
Systemic Sclerosis (ILD) pivotal study (1)	Boehringer Ingelheim, Biberach, Germany	ISR	Systemic Sclerosis associated Interstitial Lung Disease	Skin

Result Set Statistics

Top 10 Correlations

hasSpecimenTissue [Tissue]

Values

Bar chart showing values for Skin and Blood.

Demographics

Sex Ethnicity Average Age

donor sex [Sex]

Pie chart showing donor sex distribution: female (orange) and male (dark blue).

*Dynamic knowledge graph-powered discovery of statistical insights and data patterns showing metaphactory linked data exploration customised for two use-cases, clinical & preclinical studies.*





# THE ENTERPRISE KNOWLEDGE GRAPH

## Example Use Cases

### Omics data management

- » Publishing of data from multiple laboratories to enable data scientists to reuse across business needs, use cases and analyses

### IT system management

- » Interlinking of data about tickets, incidents, IT systems, IT system leads and exploration of data in context

### Document management

- » Document exploration based on topic relevance

*Building custom applications with metaphactory for our use cases was easy without too much effort or resources required.*

### Maksim Kolchin,

Knowledge Graph Platform Lead,  
Boehringer Ingelheim



# KEY TAKEAWAYS

*Technology cannot solve all issues and the knowledge graph approach also requires organizational changes.*

### Maksim Kolchin,

Knowledge Graph Platform Lead,  
Boehringer Ingelheim



## Domain experts and business users can learn to do modeling

- » An ontologist can support the modeling process at first, but non-IT experts should be empowered to contribute and extend the model to fit their needs

## Embracing cultural change is critical

New roles have been defined to support the knowledge graph initiatives

- » Data domain owners – users who own and are accountable for domain-specific data
- » Data stewards – users who collaborate with IT to integrate data

**Use case agnostic applications allow data providers to focus on data creation and management**

## RESOURCES

### Interview

with Maksim Kolchin, Knowledge Graph Platform Lead, Boehringer Ingelheim

- » <https://bit.ly/3ewS5dJ>



### Demo

Open Knowledge Graphs

- » <https://bit.ly/3RWtE79>



### Get started

Get started with metaphactory for free and start building your Knowledge Graph today!

- » <https://bit.ly/3Vrdp52>



## GET IN TOUCH

metaphacts GmbH  
info@metaphacts.com  
[www.metaphacts.com](http://www.metaphacts.com)



[@metaphacts](https://twitter.com/metaphacts)



[metaphacts-gmbh](https://www.linkedin.com/company/metaphacts-gmbh)



[metaphacts](https://www.youtube.com/channel/UC...)



**metaphacts**