

Smart Karyogram Creation

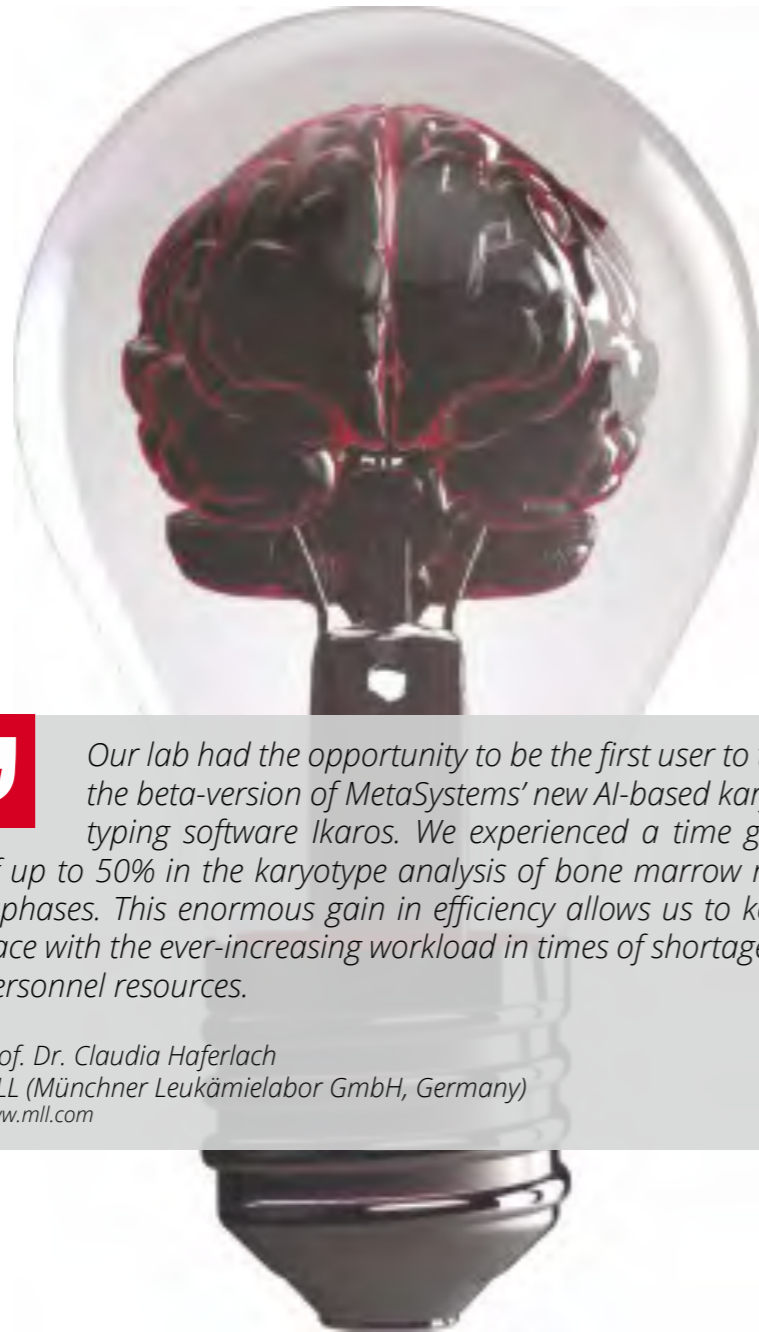
The cutting-edge
DNN functionality
for Ikaros

INNOVATION ...

Generating Karyogram Proposals with Deep Neural Networks

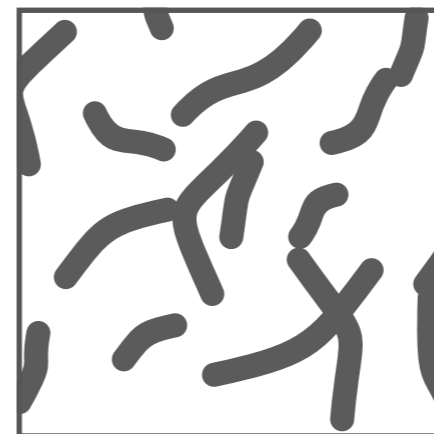
Chromosome analysis serves as a cornerstone in cytogenetics and is widely recognized as the „gold standard“ for genetic diagnostics. To support this critical work, Ikaros has long provided a suite of algorithms aimed at facilitating the workflow and to reduce the number of interactions. Yet, despite these advancements, the process of creating a karyogram remains to be a laborious and time-intensive task. Recent progress in machine learning technology has greatly improved the choices available, offering a more efficient approach.

The latest versions of Ikaros by MetaSystems have integrated features based on Deep Neural Networks (DNNs), designed to assist cytogeneticists in segmenting metaphase chromosomes and classifying them within the karyogram. This cutting-edge technology supersedes the respective algorithms used in earlier versions of Ikaros, offering the potential to markedly decrease the number of interactions needed in comparison to the former workflow.



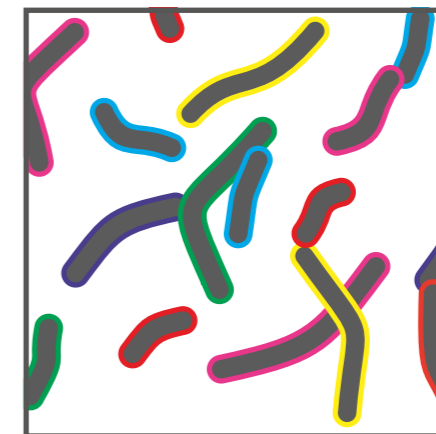
Our lab had the opportunity to be the first user to test the beta-version of MetaSystems' new AI-based karyotyping software Ikaros. We experienced a time gain of up to 50% in the karyotype analysis of bone marrow metaphases. This enormous gain in efficiency allows us to keep pace with the ever-increasing workload in times of shortage of personnel resources.

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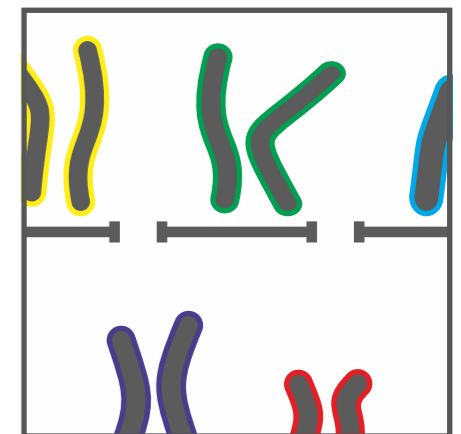
Acquisition of Images

Users can take images in Ikaros with a simple click of the mouse. With the utilization of DNN capabilities, image editing becomes unnecessary: the DNNs for chromosome separation and assignment can handle unprocessed metaphase images. This represents an initial opportunity for time savings compared to the workflows previously employed. It goes without saying that images can also be automatically captured using the Metafer metaphase finding software.



Chromosome Separation

Like its predecessors, the latest versions of Ikaros support users in separating chromosomes in the metaphase. However, the adoption of a DNN-based workflow marks a notable progression in this process, aiming to lower the rate of segmentation errors and consequently lessen the need for manual corrections by the users. This introduces the deployment of the DNN-based tools as an additional means to achieve time savings in metaphase processing.



Chromosome Assignment

In the process of karyogram creation, another traditionally laborious task is the classification of chromosomes into their appropriate classes on the karyogram form. DNN technology also aids in this step, reducing the need for manual input and corrections.

As a result, cytogeneticists are presented with an initial karyogram draft. This draft serves as a working basis for the adjustments and evaluation performed by the experienced professional.

Preserving the Tried-and-Tested

By incorporating new DNN-based features, Ikaros elevates its functionality while preserving its reputation as a reliable tool for image acquisition, processing, and karyogram creation, trusted by its users. Throughout our development efforts, we have placed a high emphasis on backward compatibility, guaranteeing that long-standing Ikaros users will effortlessly recognize the familiar features they have grown accustomed to in the latest updates.

Traceability

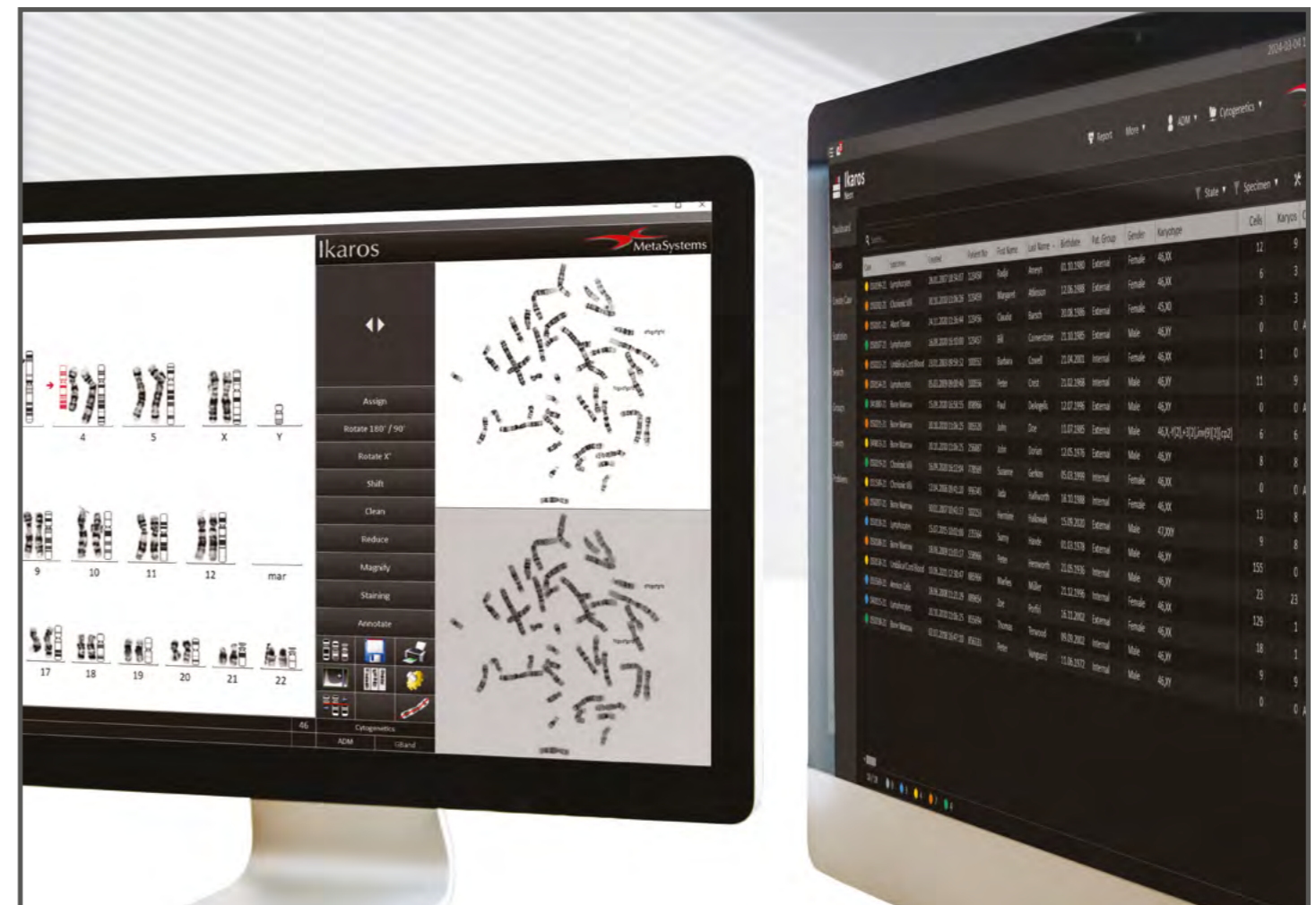
Understanding the critical role of cytogeneticists in analyzing karyograms, Ikaros emphasizes detailed documentation and traceability throughout its processing stages. This design enables easy access to original images and a clear grasp of the processing steps leading to the final results. Such transparency and accessibility allow cytogeneticists to confidently interpret karyograms and make informed decisions with a solid understanding of the imaging process.

Data Organization

In cytogenetics, efficiently handling extensive information is essential. Recognizing the complexity of cases beyond metaphase images and karyograms, we have enhanced Ikaros installations with Neon, our software for streamlined image and case management. Neon organizes all image content and related case data, ensuring systematic and protected access from initial images to the final analysis by the cytogenetic expert.

Results Reporting

After a case has been handled, it produces a significant volume of data, such as images, karyotypes for each image, patient details, and other relevant information about the case. Ikaros and Neon excel at organizing this information into comprehensive reports, leveraging their robust data summarization capabilities and graphical report editing tools. Additionally, their built-in statistical query engine allows for cross-case statistical analysis, enhancing the richness and utility of the reports produced.



... AND CONSISTENCY

Modularity

Ikaros provides an extensive selection of features, ranging from options for both automatic and manual image capture, to the capability of processing images with or without the aid of DNNs, through to diverse workflow evaluation methods, and the choice of processing images in either monochrome or color. Consequently, we have designed the Ikaros ecosystem to be modular, establishing various license subsets to address the different tasks. This design enables you to tailor your workstations to your specific preferences.

Please do not hesitate to get in touch with us whenever you need. We are ready to assist you in navigating your options and configuring an installation that perfectly aligns with your requirements.



Q Does Ikaros equipped with DNN capabilities fully automate the creation of karyograms?

Answer:

No. In the new versions of Ikaros, the DNN capabilities facilitate the segregation of chromosomes and their categorization into the appropriate karyogram classes. This process yields a preliminary suggestion that requires further assessment and potential modification by a skilled user. Ultimately, the cytogeneticist is responsible for creating the final karyogram and conducting its analysis.

Q Can I change the results of the DNN-based chromosome segregation and assignment?

Answer:

Yes, once Ikaros generates a karyogram proposal via its DNN features, users have the possibility and the responsibility to review and, if needed, amend this proposal. They have access to the same respective tools that have been present in earlier versions of Ikaros. Nevertheless, when an appropriate DNN is utilized, it is anticipated that the need for manual adjustments will be considerably reduced compared to the machine learning algorithms used in prior versions.

Q How much time will the DNN-based functions save me per case or per karyogram?

Answer:

The response to this inquiry is contingent on various elements. Factors such as the nature of preparations, working methods employed, and the time allocated for result verification and reporting all play crucial roles in determining processing time. Nonetheless, insights from laboratories that have adopted the feature indicate a noticeable decrease in case processing times, attributed to the diminished requirement for manual intervention in contrast to the algorithms previously in use.

Q Is it necessary to replace my current Ikaros installations to access the DNN functionalities?

Answer:

No, there is no need for a replacement. Starting with version 6.3, every new version of Ikaros comes ready for DNN-based chromosome separation and classification and can be upgraded to include this feature. For efficient handling of DNN operations, an additional graphics card is needed to facilitate the computations. This card can be installed directly in the workstation or in a distinct system. For further information on the technical options available, please feel free to get in touch with us.



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CE  Metafer 4.3 and Ikaros 6.3 are classified as in vitro diagnostic medical devices (IVD) in the European Union in accordance with In Vitro Diagnostics Regulation (EU) 2017/746 or In Vitro Diagnostic Medical Device Directive 98/79/EC, respectively, and carry the CE label unless otherwise indicated. Use all MetaSystems IVD products only within the scope of their intended purpose.

Neon serves as general data management software.

MetaSystems products are used in many countries worldwide. Depending on the regulations of the respective country or region, some products may not be used for clinical diagnostics.

Some hardware components supplied by other manufacturers are not included in MetaSystems IVD products and are therefore not IVD medical devices.

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