



National Competence Centre Bulgaria

Supercomputing
power for
industrial
breakthroughs!

NCC Bulgaria is built by a consortium coordinated by the Institute of Information and Communication Technologies at the Bulgarian Academy of Sciences (IICT-BAS), and two members, the Sofia University "St. Kliment Ohridski" (SU), and the University of National and World Economy (UNWE).

OBJECTIVES

HPC Adoption & Skills

- Strengthen the position of NCC Bulgaria as a focus point for HPC users in Bulgaria
- Improve the NCC visibility at the European level, and collaborate with HPC-related initiatives

SMEs, Industry & Economy

- Create and maintain a comprehensive portfolio of services
- Facilitate access to HPC infrastructure and attract new users from industry, academia and PA

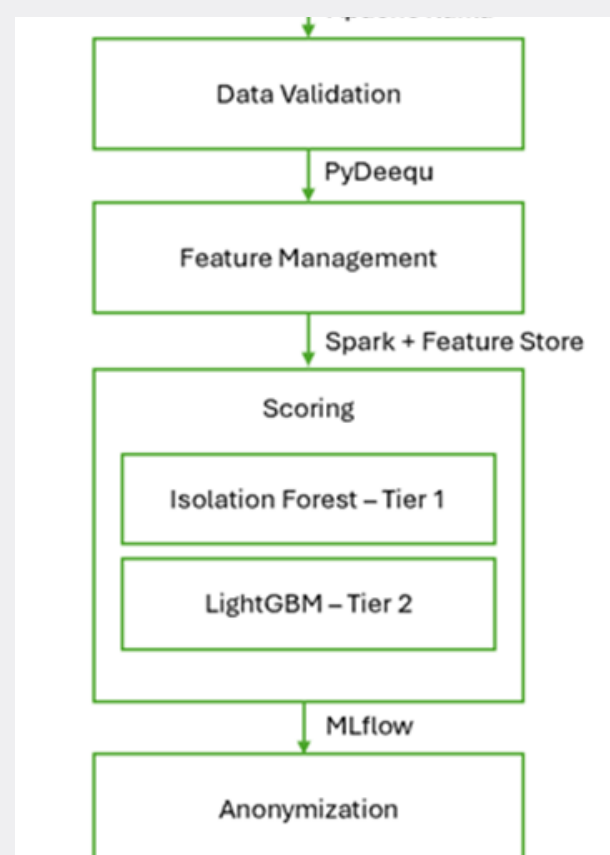
European Positioning

- Deliver local and national training, facilitating HPC skills
- Raise awareness and outcomes on the HPC/HPDA/AI and the available services

SUCCESS STORIES

Real-Time Fraud Detection in Digital Marketing with Machine Learning & Spark

Benefits

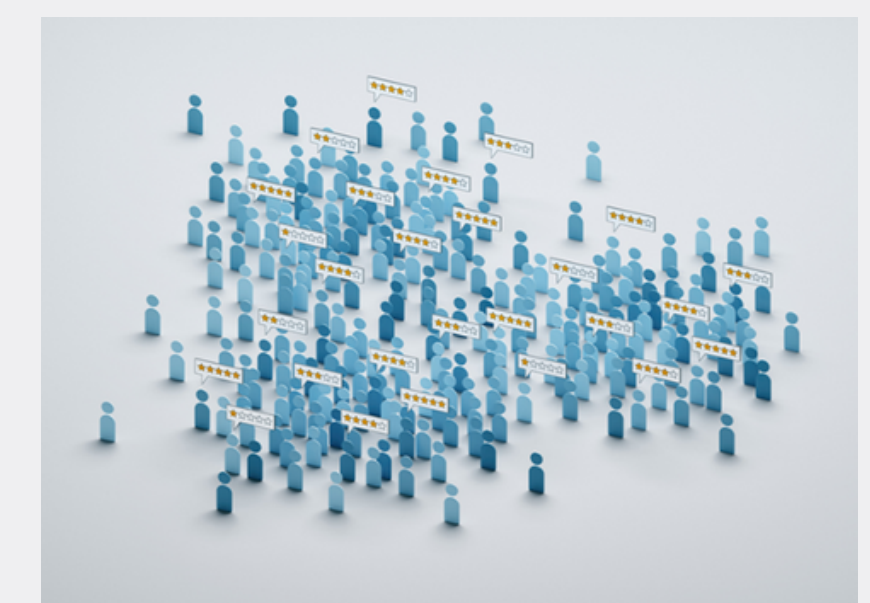


- Prevents ad fraud, safeguards campaign ROI and credibility
- Fine-tuned detection minimizes false positives, enhances trust, and improves the user experience
- Cross-platform normalization improves insights and decision-making
- GDPR-compliant data handling without manual intervention
- Automated, GPU-accelerated retraining (via MLflow) - keeps detection adaptive, efficient, and downtime-free

Getting insights on customer data and the probability of default with the help of AI algorithms

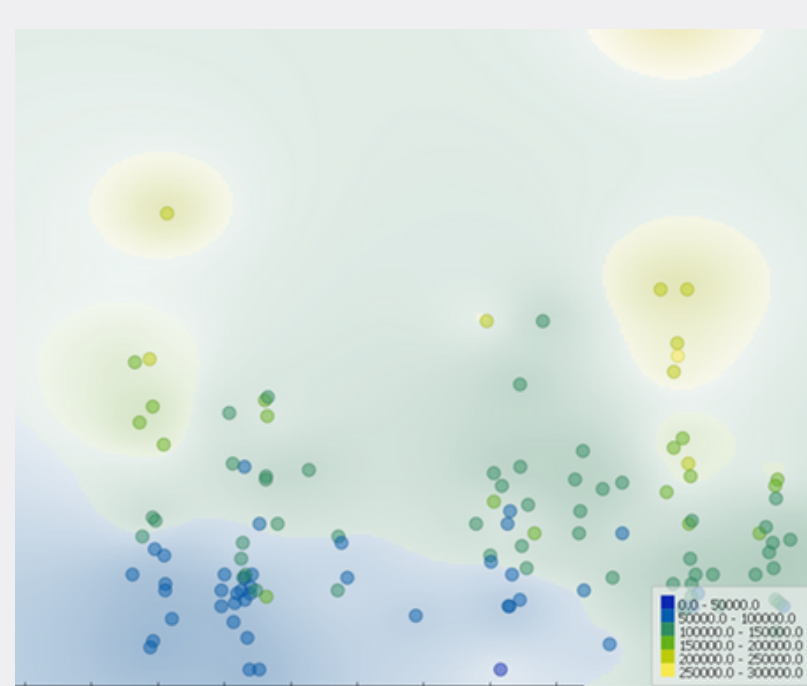
Benefits

- Informed strategic planning via predictive analytics
- Time savings through automation of data collection and analysis
- Enhanced customer retention via proactive risk management
- Cost savings by avoiding non-paying orders



Predicting Housing Prices Using Data Mining Techniques with HPC

Benefits

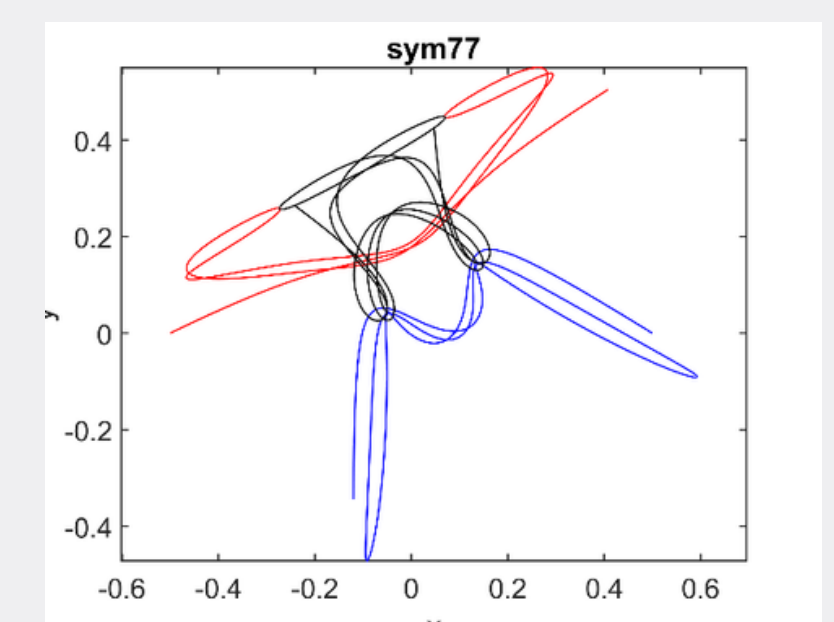


- Optimized model accuracy with HPC - strong performance metrics ($R^2 \approx 0.708$) achieved even on limited data
- Fast, precise housing price predictions - helped agents and property owners set competitive, fair values
- Scalable insights and deeper market understanding - revealed how factors like location and view influence prices

More than 12,000 new periodic free-fall orbits for the three-body problem

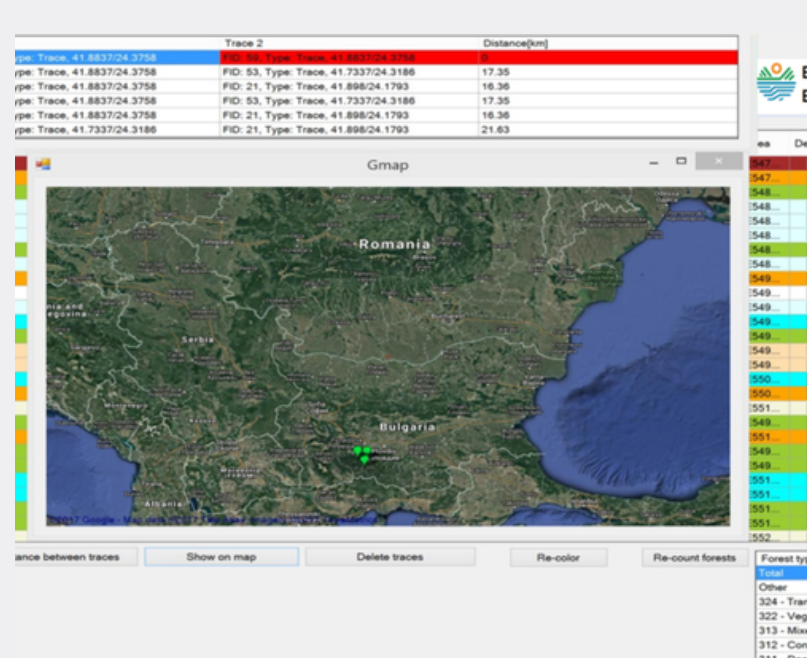
Scientific Impact

- 12,409 distinct free-fall orbit solutions identified - significantly expanding prior findings
- Discovery of 236 geometrically symmetric ("self-dual") orbits - newly characterized structures of interest
- Revealed the "Maasai shield" pattern in initial condition distribution - showing remarkable domain structure
- Over 100x speed-up in search computations via HPC (Nestum cluster) - enabling scale of discovery



HPDA service for estimating the brown bear population in Bulgaria

Impact

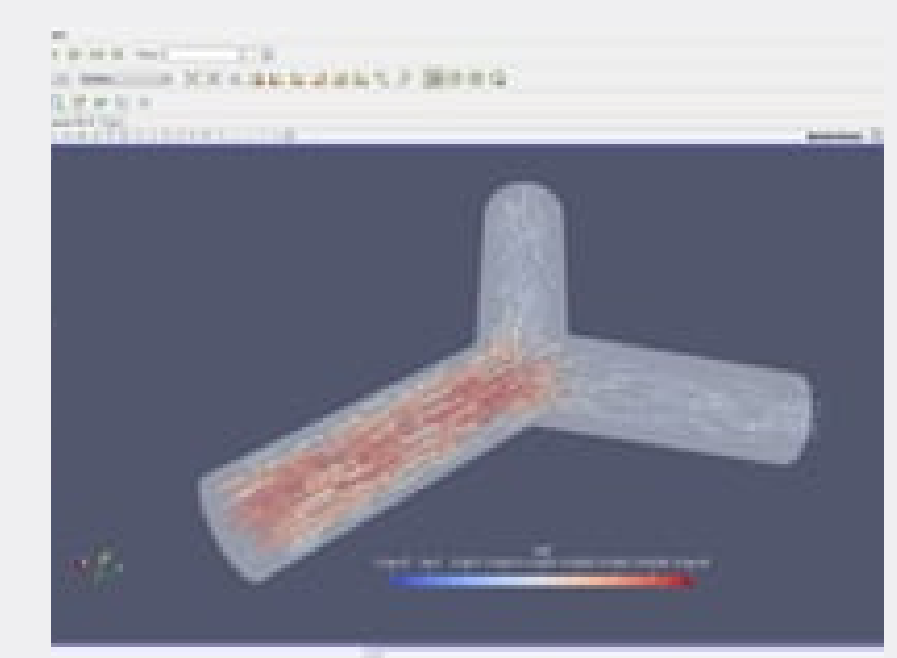


- Enhanced accuracy in bear population estimation - via advanced statistical modeling and data integration
- Accelerated, informed conservation decisions - enable quick analysis considering habitat types, climate, threats, and human impact
- Preservation of biodiversity
- Economic boost through tourism and ecotourism

Cloud-based HPC Simulations on Discoverer with Nimbox

Impact

- Cloud-based GUI via Nimbox for Discoverer user interface - removes command-line complexity for non-technical users
- Seamless migration across supercomputers and to cloud platforms - enabling flexible infrastructure access
- Simplified connection to HPC resources
- Easy access to alternative supercomputers or traditional clouds



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