world community grid

NEWSLETTER

November 2024

Celebrating the Twentieth Anniversary of the World Community Grid: A Legacy of Philanthropic Computing for Scientific Progress

This year, we celebrate the twentieth anniversary of the World Community Grid (WCG). Launched in 2004 by IBM, WCG began as an ambitious project to mobilize spare computer power toward tackling global challenges in health, poverty, and sustainability. Over the past two decades, it has made an immense impact, achieving millions of CPU-years of computation across various research projects benefiting humanity. Today, Krembil Research Institute, part of the University Health Network (UHN), continues to drive WCG's mission, furthering IBM's legacy by expanding its reach and focus.

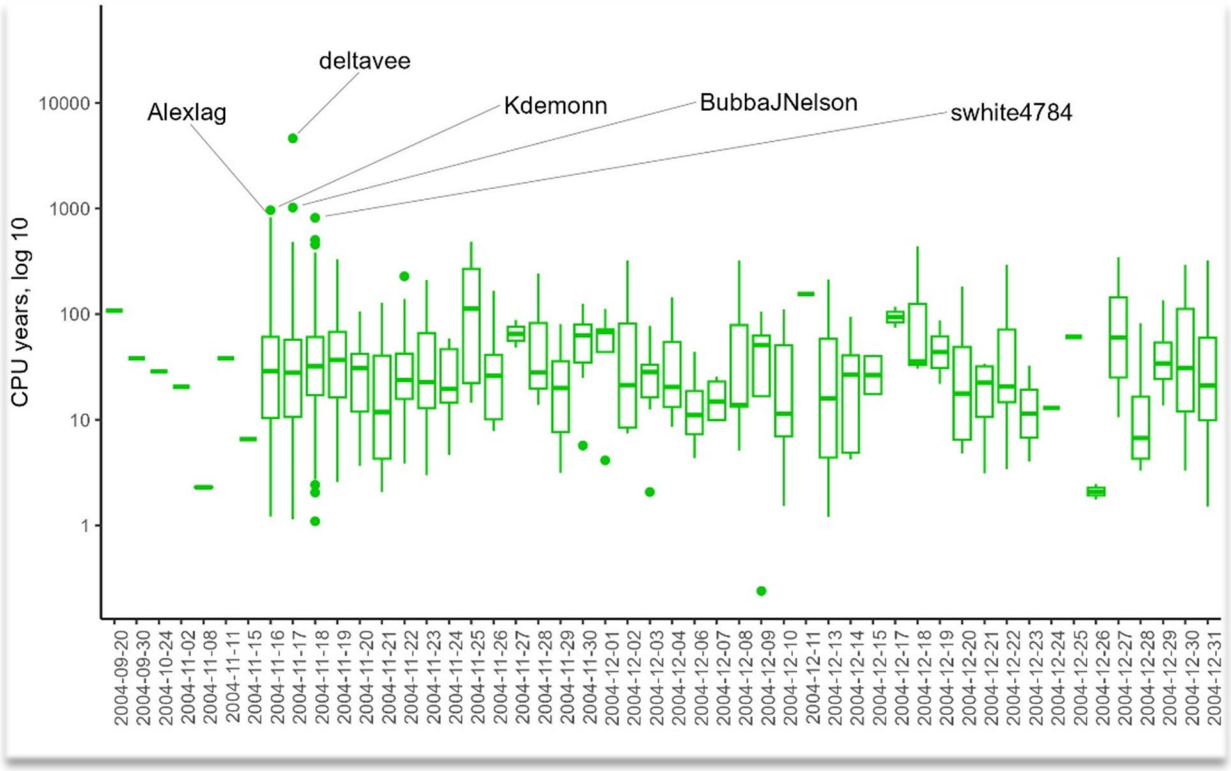
Our Vision: *A healthier world.*

Our Mission: *Accelerating science by creating a supercomputer empowered by a global community of volunteers.*

Since its inception, WCG has supported 32 research projects worldwide, enabling discoveries that span the fields of cancer, tuberculosis, COVID-19, HIV/AIDS, microbiome immunity, understanding genomes and protein structure, developing new materials, clean energy, ensuring sustainable water, understanding weather patterns in Africa, and other globally important projects. Projects like Mapping Cancer Markers and FightAIDS@Home have become cornerstones in the fight against devastating illnesses by identifying potential drug targets and genetic markers critical for understanding disease progression and treatment response. WCG's pioneering work has been celebrated globally, receiving awards such as the Computerworld Data+ Editors' Choice Award and the Asian CSR Award, underscoring its importance as one of the most impactful volunteer computing efforts to date.

The community's contributions have been vital for the success and continuity of WCG. Over the years, more than 814,800 volunteers have collectively donated over 2.6 million years of computing time, making it one of the largest computational resources available to the global scientific community. This model has not only provided researchers with invaluable resources but also fostered a unique sense of global camaraderie and shared purpose. In addition, partnering with universities and high schools enables youth outreach and education programs that help prepare the next generation of scientists.

599 volunteers have joined in 2004 and are still crunching data today. Thank you for this strong and lasting dedication and contribution! Happy anniversary to you! As shown in the figure below, five of these original volunteers provided more than 800 CPU years since they joined WCG. We are very grateful for such dedicated efforts that empowered multiple projects on the WCG.



Since 2021, Jurisica Lab at the Krembil Research Institute has taken on the stewardship of WCG, carrying IBM's vision forward while expanding the initiative's outreach efforts and computational focus, your outreach and new projects.

As World Community Grid embarks on its third decade, we look forward to the exciting advancements that will emerge from this thriving community of scientists and volunteers. The grid's enduring success attests to the incredible potential of crowdsourced computing and the vital role it plays in addressing global challenges. Here's to two decades of transformative impact—and to many more years of collaboration, discovery, and hope for a brighter future.

CURRENT PROJECTS UPDATES

Africa Rainfall Project

The Africa Rainfall Project (ARP) resumed operations on November 4, 2024, following nearly two years of pause due to technical constraints on the ARP science team. Managed by Delft University of Technology (TU Delft) in collaboration with the World Community Grid (WCG), ARP addresses the unique challenge of predicting rainfall in sub-Saharan Africa, where agricultural productivity depends heavily on accurate, localized rainfall data. With recent advancements in data storage, automation, and crowdsourced computing, ARP will continue its mission to deliver high-resolution rainfall simulations that can improve local weather forecasting for the region's rain-dependent agriculture.

Project Background: Addressing Rainfall Forecasting Needs in Sub-Saharan Africa

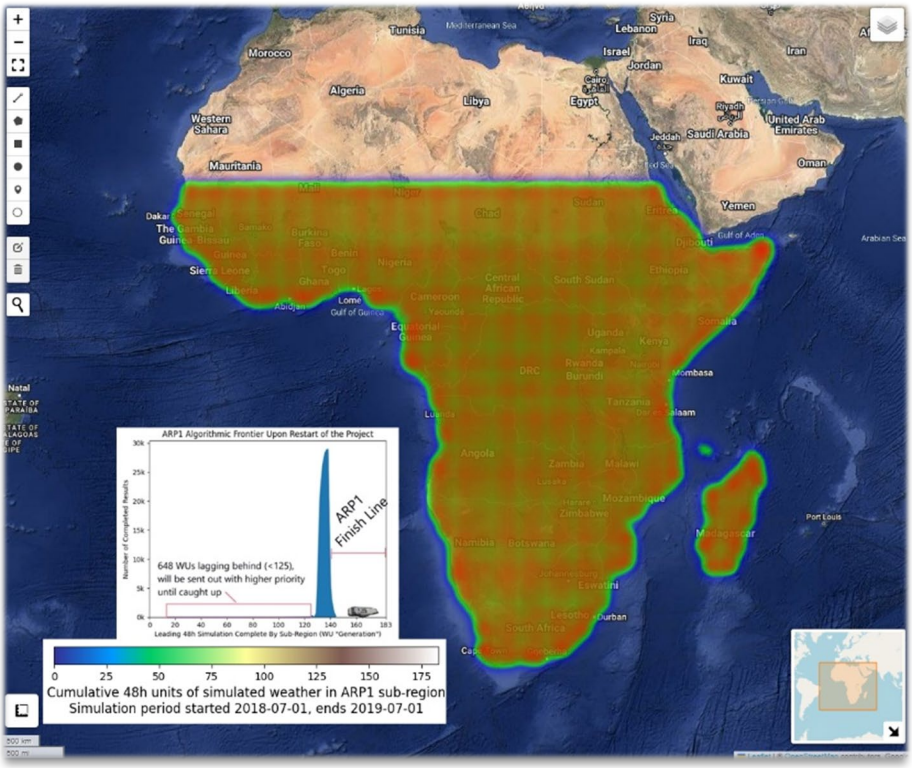
Agriculture in sub-Saharan Africa is predominantly rain-fed, with about 95% of food production relying on seasonal rain patterns. In this region, extreme weather events such as droughts, floods, and unpredictable rainfall pose significant threats to farming and food security. Yet conventional weather forecasting models often lack the fine spatial resolution required to detect rainstorms that might impact a single farm, making it difficult for farmers to plan around weather fluctuations.

The Africa Rainfall Project was conceived to close this gap by generating kilometer-scale simulations that provide highly localized data on rainfall patterns. This approach not only enhances farmers' decision-making capabilities but also aids policymakers and water resource managers, ultimately contributing to climate resilience in the region. Through ARP, TU Delft and WCG aim to improve the accuracy and timeliness of rainfall forecasting by harnessing crowdsourced computational power, an approach that democratizes scientific research while addressing an essential need for Africa's agricultural economy.

Technical Hurdles and Recent Innovations

In December 2022, ARP encountered a major setback when data storage limitations on the national high-performance computing (HPC) platform (Netherlands) forced the project into a temporary pause. With each work unit (a small portion of the simulation) generating 60 MB of data, the project quickly reached the limits of its initial storage system within the Dutch HPC infrastructure. This challenge necessitated innovative solutions to ensure sustainable data management.

Over the past year, the project team worked with Amazon Web Services (AWS) to develop a sufficient and more sustainable storage solution that allows ARP to handle large volumes of data for a longer period of time. Once this was prepared, WCG had to offload the past processed data to the new destination, and set up the access to and from the AWS storage. Additionally, WCG with the assistance from TU Delft has implemented a new system for workunit generation on the WCGF side, streamlining the process of generating, distributing, and synchronizing work units for volunteers, and in turn improved project scalability.



Scientific and Agricultural Impact: A Community-Driven Effort

With the restart, ARP is poised to enhance weather prediction capabilities that will directly benefit local communities. Simulations at the 1 km scale are invaluable in accurately forecasting rainstorms for specific areas, an advantage that could be transformative for the region's rain-dependent agriculture. For farmers, planners, and water resource managers, ARP's forecasts offer actionable insights that can reduce crop losses, optimize resource allocation, and improve food security.

The success of ARP not only marks a milestone in forecasting precision for sub-Saharan Africa but also reinforces the potential of technology-driven scientific research to create real-world impact. Through the continued support of WCG volunteers and the project team at TU Delft, ARP is ready to contribute valuable data and insights that may prove essential for sustainable development in Africa's agriculture and beyond.

Smashing Childhood Cancer and Help Stop TB

The two project are now concluded and the researchers are hard at work analysing the data obtained. They are all very thankful for the volunteers' contributions and will share publications that will arise from the calculations performed through the WCG.

NEW PROJECT LAUNCH

Mapping Arthritis Markers: A New Frontier in Arthritis Research

The Mapping Arthritis Markers (MAM) project, set to launch on the World Community Grid, aims to uncover genetic and protein-based markers linked to different forms of arthritis, a prevalent and often debilitating group of diseases affecting millions worldwide. Arthritis, a chronic condition characterized by joint inflammation, pain, and stiffness, includes various types such as osteoarthritis, rheumatoid arthritis, and psoriatic arthritis. These forms differ in their underlying causes and the specific biomarkers that could aid in early detection, prognosis, and customized treatment strategies.

Project Background: The Importance of Arthritis Biomarker Discovery

Arthritis affects more than 58 million people in the U.S. alone, with a global impact that causes significant limitations in mobility and quality of life. Although advances in research have improved treatment approaches, arthritis remains complex due to its variability among individuals and its progressive nature. Identifying specific biomarkers—molecular indicators in tissue or blood samples—can offer invaluable insight into susceptibility, progression, and treatment response.

For example, two patients with osteoarthritis might respond differently to the same treatment due to variations in their genetic and protein marker profiles. By mapping these markers, the project aims to empower researchers and clinicians to develop more personalized care, enhance early detection, and reduce the impact of arthritis on patients' daily lives.

The Mapping Markers Approach: Leveraging Crowdsourced Computing for Complex Analysis

Mapping Arthritis Markers (MAM) will apply the massive power of volunteer computing to the challenge of characterising psoriatic arthritis (PsA). The project will screen data extracted from skin samples from areas with and without lesions and identify the characteristic biomarkers that are distinct in patients with PsA compared with patients with psoriasis. By analyzing these samples on a molecular level, researchers aim to identify patterns and combinations of markers that correlate with arthritis development, progression, and responses to various treatments.

Due to the large volume of data required to map relevant arthritis markers accurately, researchers will rely on software optimized to target specific, high-priority marker combinations. This heuristic-based software significantly narrows the focus, making the project feasible for large-scale crowdsourced computing without compromising the breadth of analysis.

Potential Impact: Advancing Personalized Treatment for Arthritis

By identifying clinically significant arthritis markers, MAM hopes to achieve breakthroughs in several areas:

- **Early Detection and Risk Assessment:** MAM aims to identify markers that signal an increased risk of developing arthritis, allowing for preventive care strategies and early intervention.
- **Personalized Treatment Planning:** Marker analysis can help customize treatments based on an individual's genetic profile, potentially improving treatment efficacy and minimizing side effects.
- **Accelerated Arthritis Research:** By refining data analysis methods, MAM will streamline the marker discovery process, benefiting not only arthritis research but also other diseases that might share similar molecular patterns.

A Collaborative Effort for Better Health

The launch of Mapping Arthritis Markers underscores the role of global community engagement in scientific advancements. Through the collective power of World Community Grid volunteers, MAM researchers can access the computing power needed to conduct high-impact studies without the prohibitive costs typically associated with such large-scale data analysis.

FUNDRAISING CAMPAIGN

We would like to thank you for donating computing power to support research projects and diminishing computational bottlenecks for open science. We are immensely grateful for the passion of the volunteers who support WCG and its mission to accelerate science.

As you know, the cost to run WCG comes from the lab research funding. We need your support more than ever before. Over the last year, we have started the fundraising campaign (https://www.cs.toronto.edu/~juris/jlab/mcm.html?tab=donations) to support back-end operation of the WCG. As an academic group, we face significant financial (and technical) challenges in providing the same level of support to the global research community as IBM was able to. We continue to search for long-term partners that could help supplement research funding we use for supporting the operation of WCG. If you have some contacts that may help, please, let us know.

If you could spare additional resources to support us, there are multiple ways of donating to WCG, which are highlighted below.

- One time donation directly to the WCG at UHN Foundation;
- Monthly donation directly to the WCG at UHN Foundation.
- Should you wish to receive a US tax receipt, please call UHN Foundation at 416-603-5300 or toll free at 1-877-846-4483 (UHN-GIVE).

Thank you! Together, we will provide the necessary platform for important research benefiting humanity.