

# Distributed Computing

Astronomy & Astrophysics - Arts

Biology & Medicine - Chemistry - Climate study

Cognitive science - Computer science - Cryptography

Earth & Environmental science - History - Language & Literature - Social science

Mathematics (Integer factorization, Number theory, Prime numbers)

Physics (Large Hadron Collider) - Software testing (Chess engines) - Statistics - Others

## Astronomy

Cosmology@Home - Find the most accurate models that best describe the universe

Milkyway@Home - Create a highly accurate three-dimensional model of the Milky Way galaxy using data collected from the Sloan Digital Sky Survey

Stardust@home - Scans/analyzes the collection grid from the NASA Stardust mission to capture particles from the coma of comet Wild 2

Universe@Home - Universe@Home aims to create the first database of the simulated stellar content of the Universe, from the earliest stars to the most exotic black hole binaries

# Astrophysics

> Astronomy / Physics / Chemistry

Asteroids@home - To significantly enlarge our knowledge of the physical properties of asteroids

Einstein@Home - Search for pulsars using radio signals and gravitational wave data

Galaxy Zoo - Classifies galaxy types from the Sloan Digital Sky Survey

AstroQuest - Complete quests to help Australian scientists understand how galaxies grow and evolve.

# Astronomy & Astrophysics

> Zooniverse - 20 space projects:

| | | |
|---|---|---|
| PLANET FOUR | LOFAR | STAR NOTES |
| MAPPING HISTORIC SKIES | CLUMP SCOUT | GALAXY ZOO MOBILE |
| HUBBLE ASTEROID HUNTER | ZWICKY'S QUIRKY TRANSIENTS | PLANET HUNTERS TESS |
| SUPERWASP VARIABLE STARS | VARIABLE STAR ZOO | GALAXY ZOO |
| SOLAR STORMWATCH II | EXOPLANET EXPLORERS | ASTRONOMY REWIND |
| PLANET 9 | GRAVITY SPY | RADIO METEOR ZOO |
| SUPERNOVA HUNTERS | TERRAINS | |

# Arts

BURP - Rendering of 3D animations

Electric Sheep - Screen Saver for desktop and laptop computers

> Zooniverse - 7 arts projects:

| | |
|---|---|
| FISHING IN THE PAST | VINTAGE CUBAN RADIO |
| MAPPING HISTORIC SKIES | HERITAGE QUEST |
| CRIMINAL CHARACTERS | AFRICAN AMERICAN CIVIL WAR SOLDIERS |
| SCRIBES OF THE CAIRO GENIZA | |

## Biology - Molecular biology

Folding@home - Understand protein folding, misfolding, and related diseases, with a minor emphasis in protein structure prediction; computing power also harnessed the power of PlayStation 3s

RNA World - Uses bioinformatics software to study RNA structure

Rosetta@home - Protein structure prediction for disease research

GPUGRID - Many graphics cards (GPUs) joined together to deliver high-performance all-atom biomolecular simulations

## Biology

> Zooniverse - 61 biology projects:

| | | |
|---|---|---|
| JUNGLE WEATHER | THE KOSTER SEAFLOOR OBSERVATORY | NOTES FROM NATURE - FLORA OF TEXAS AND OKLAHOMA |
| NEST QUEST GO - HUMMINGBIRDS | FISHING IN THE PAST | SEAL WATCH |
| NOTES FROM NATURE - MI-BUG | WILD MONT-BLANC | NOTES FROM NATURE - TERRESTRIAL PARASITE TRACKER |
| NEST QUEST GO - ROBINS | UNIVERSITY OF WYOMING RACCOON PROJECT | SNAPSHOT BLOUBERG |
| OFFAL WILDLIFE WATCHING | ETCH A CELL - POWERHOUSE HUNT | EYE FOR DIABETES |

## Biology (2)

| | | |
|---|---|---|
| NOTES FROM NATURE - HERBARIUM | NOTES FROM NATURE - NYBG | AÑO NUEVO ISLAND - ANIMAL COUNT |
| NOTES FROM NATURE - SOUTHEASTERN U.S. BIODIVERSITY | NOTES FROM NATURE - CAPTURING CALIFORNIA'S FLOWERS | CHIMP&SEE |

| | | |
|---|---|---|
| SECRET LIVES OF MICE | SKINK SPOTTER NZ | NOTES FROM NATURE - BUTTERFLIES |
| SNAPSHOT KGALAGADI | NOTES FROM NATURE - PLANTS OF ARKANSAS | WILDWATCH BURROWING OWL |
| NOTES FROM NATURE - CALBUG | NOTES FROM NATURE - WEDIGFLPLANTS | PLANT LETTERS |
| TARANAKI MOUNGA | VIRUS FACTORY | |

## Biology (3)

| | | |
|---|---|---|
| SNAPSHOT MOUNTAIN ZEBRA | SNAPSHOT KAROO | EYES ON THE WILD |
| MONKEY HEALTH EXPLORER | BELUGA BITS | SOUTH SUDAN DIVERSITYCAM |
| LONDON BIRD RECORDS | PENGUIN WATCH | EMAMMAL |
| INVADER ID | MANATEE CHAT | GROUSE GROOVES |
| READING NATURE'S LIBRARY | CALGARY CAPTURED | SCIENCE SCRIBBLER |
| SNAPSHOT GRUMETI | SNAPSHOT SERENGETI | |

## Biology (4)

| | | |
|---|---|---|
| SNAPSHOT RUAHA | PROJECT PLUMAGE | FLOATING FORESTS |
| PARASITE SAFARI | SEABIRDWATCH | WILDWATCH KENYA |
| WEDDELL SEAL COUNT | FOSSIL ATMOSPHERES | WESTERN MONTANA WILDLIFE |
| BASH THE BUG | CHICAGO WILDLIFE WATCH | MAPPING CHANGE |
| SNAPSHOT WISCONSIN | WILDCAM GORONGOSA | |

## Medicine

DENIS@Home - Research in Cardiac Electrophysiology

DreamLab - Breast, ovarian, prostate and pancreatic cancer [1)]

> Zooniverse - 7 medicine projects:

| | | |
|---|---|---|
| ETCH A CELL - POWERHOUSE HUNT | EYE FOR DIABETES | SECRET LIVES OF MICE |

| | | |
|---|---|---|
| VIRUS FACTORY | MONKEY HEALTH EXPLORER | SCIENCE SCRIBBLER |
| BASH THE BUG | | |

## Climate study

Climateprediction.net - Investigates the approximations that have to be made in state-of-the-art climate models [2)]

> Zooniverse - 12 climate projects:

| | | |
|---|---|---|
| JUNGLE WEATHER | WEATHER 100 - ESKDALEMUIR | WILD MONT-BLANC |
| NOTES FROM NATURE - NYBG | SKINK SPOTTER NZ | CASTAWAY |
| PENGUIN WATCH | INVADER ID | FLOATING FORESTS |
| PARASITE SAFARI | FOSSIL ATMOSPHERES | MAPPING CHANGE |

## Chemistry

Cleanmobility.now - Find safer and greener materials for e-vehicle batteries

Quantum Medicinal Chemistry at Home - Do quantum-mechanical computations on medically relevant biomolecular systems, to help with developing quantum-mechanics-based approaches for computational drug design

## Cognitive science

MindModeling@Home - Builds cognitive models of the human mind

## Computer science

iThena - Generally computer networks

## Cryptography

Distributed.net - Crack the RC5-72 cipher, find optimal Golomb rulers of length 28

Enigma@Home - Decode 3 unbroken Enigma messages from World War II

Moo! Wrapper - Combines BOINC with distributed.net to try to break the RC5 cipher

## Earth & Environmental science

Quake Catcher Network - Seismic Monitoring - An accelerometer is needed to run this project, for others an USB attachment is necessary

> Zooniverse - 64 nature projects:

| | | |
|---|---|---|
| WEATHER 100 - ESKDALEMUIR | THE KOSTER SEAFLOOR OBSERVATORY | NOTES FROM NATURE - FLORA OF TEXAS AND OKLAHOMA |
| HUMMINGBIRDS | FISHING IN THE PAST | SEAL WATCH |
| NOTES FROM NATURE - MI-BUG | WILD MONT-BLANC | NOTES FROM NATURE - TERRESTRIAL PARASITE TRACKER |

## Earth & Environmental Science (2)

| | | |
|---|---|---|
| ROBINS | UNIVERSITY OF WYOMING RACCOON PROJECT | SNAPSHOT BLOUBERG |
| OFFAL WILDLIFE WATCHING | ETCH A CELL - POWERHOUSE HUNT | EYE FOR DIABETES |
| NOTES FROM NATURE - HERBARIUM | HERITAGE QUEST | NOTES FROM NATURE - NYBG |
| AÑO NUEVO ISLAND - ANIMAL COUNT | NOTES FROM NATURE - SOUTHEASTERN U.S. BIODIVERSITY | |
| NOTES FROM NATURE - CAPTURING CALIFORNIA'S FLOWERS | CHIMP&SEE | SKINK SPOTTER NZ |

## Earth & Environmental Science (3)

| | | |
|---|---|---|
| NOTES FROM NATURE - BUTTERFLIES | SNAPSHOT KGALAGADI | NOTES FROM NATURE - PLANTS OF ARKANSAS |
| WILDWATCH BURROWING OWL | NOTES FROM NATURE - CALBUG | NOTES FROM NATURE - WEDIGFLPLANTS |

| | | |
|---|---|---|
| CASTAWAY | PLANT LETTERS | TARANAKI MOUNGA |
| SNAPSHOT MOUNTAIN ZEBRA | SNAPSHOT KAROO | EYES ON THE WILD |
| EARTHQUAKE DETECTIVE | MONKEY HEALTH EXPLORER | THE WILDS' WILDLIFE WATCH |
| BELUGA BITS | SOUTH SUDAN DIVERSITYCAM | |
| SNAPSHOT HOGE VELUWE | LONDON BIRD RECORDS | PENGUIN WATCH |

## Earth & Environmental Science (4)

| | | |
|---|---|---|
| EMAMMAL | INVADER ID | MANATEE CHAT |
| GROUSE GROOVES | READING NATURE'S LIBRARY | CALGARY CAPTURED |
| SNAPSHOT GRUMETI | SNAPSHOT SERENGETI | SNAPSHOT RUAHA |
| PROJECT PLUMAGE | FLOATING FORESTS | PARASITE SAFARI |
| SEABIRDWATCH | WILDWATCH KENYA | WEDDELL SEAL COUNT |
| FOSSIL ATMOSPHERES | WESTERN MONTANA WILDLIFE | |
| BASH THE BUG | CHICAGO WILDLIFE WATCH | MAPPING CHANGE |
| SNAPSHOT WISCONSIN | WILDCAM GORONGOSA | |

## History

> Zooniverse - 26 history projects:

| | |
|---|---|
| JUNGLE WEATHER | NOTES FROM NATURE - FLORA OF TEXAS AND OKLAHOMA |
| NOTES FROM NATURE - MI-BUG | NOTES FROM NATURE - TERRESTRIAL PARASITE TRACKER |
| STAR NOTES | MAPPING HISTORIC SKIES |
| MEASURING THE ANZACS | NOTES FROM NATURE - HERBARIUM |
| HERITAGE QUEST | NOTES FROM NATURE - NYBG |
| NOTES FROM NATURE - SOUTHEASTERN U.S. BIODIVERSITY | NOTES FROM NATURE - CAPTURING CALIFORNIA'S FLOWERS |
| NOTES FROM NATURE - BUTTERFLIES | NOTES FROM NATURE - PLANTS OF ARKANSAS |

## History (2)

| | |
|---|---|
| MACDONALD DICTIONARY | NOTES FROM NATURE - CALBUG |
| NOTES FROM NATURE - WEDIGFLPLANTS | CRIMINAL CHARACTERS |
| CASTAWAY | PLANT LETTERS |
| THE AMERICAN SOLDIER | AFRICAN AMERICAN CIVIL WAR SOLDIERS |
| BEHIND THE SCENES AT SUPREME COURT CONFERENCE | ANTI-SLAVERY MANUSCRIPTS |
| SCRIBES OF THE CAIRO GENIZA | ASTRONOMY REWIND |

## Language & Literature

> Zooniverse - 4 language projects [3]:

| | |
|---|---|
| VINTAGE CUBAN RADIO | BEHIND THE SCENES AT SUPREME COURT CONFERENCE |
| ANTI-SLAVERY MANUSCRIPTS | SCRIBES OF THE CAIRO GENIZA |

## Social science

> Zooniverse - 12 social science projects:

| | |
|---|---|
| VINTAGE CUBAN RADIO | POWER TO THE PEOPLE |
| STAR NOTES | MEASURING THE ANZACS |
| HERITAGE QUEST | CHIMP&SEE |
| CRIMINAL CHARACTERS | THE AMERICAN SOLDIER |
| AFRICAN AMERICAN CIVIL WAR SOLDIERS | BEHIND THE SCENES AT SUPREME COURT CONFERENCE |
| ANTI-SLAVERY MANUSCRIPTS | SCRIBES OF THE CAIRO GENIZA |

## Mathematics

Collatz Conjecture - Study the Collatz conjecture, an unsolved conjecture in mathematics

Gerasim@Home - Researched in discrete mathematics and logic control systems

SRBase - Solving Mathematical problems of Sierpinski/Riesel Base

Van Der Waerden Numbers - Mathematical solutions relating to Van Der Waerden Theorem

## Mathematics - Integer factorization

NFS@Home - Performs parts of the Number Field Sieve in the factorization of large integers

## Mathematics - Number theory

NumberFields@Home - Search for number fields with special properties to assist with the formulation of mathematical conjectures

## Mathematics - Prime numbers

Great Internet Mersenne Prime Search (GIMPS) - Searches for Mersenne primes of world record size

Primaboinca - Search for counterexamples to Agrawal's conjecture and Popovych's conjecture, which relate to the identification of prime numbers

Twin Prime Search - Searches for large twin primes

WEP-M+2 Project - Investigates the factorization of Mersenneplustwo prime numbers

PrimeGrid - Searching for large twin primes of the form k*2^n+1 and k*2^n-1

## Physics

Radioactive@home - Real-time radioactivity monitoring, detected by gamma sensors connected to volunteer computers

> Zooniverse - 13 physics projects:

| | | |
|---|---|---|
| LOFAR | STAR NOTES | CLUMP SCOUT |
| GALAXY ZOO MOBILE | PLANET HUNTERS TESS | EARTHQUAKE DETECTIVE |
| SUPERWASP VARIABLE STARS | GALAXY ZOO | STEELPAN VIBRATIONS |
| EXOPLANET EXPLORERS | GRAVITY SPY | RADIO METEOR ZOO |
| SUPERNOVA HUNTERS | | |

## Physics - Large Hadron Collider

LHC@home - Improve the design of the Large Hadron Collider and its detectors

- Sixtrack - Create better beams!
- ATLAS@home - Discover particles!
- CMS@Home - Open a window to theories beyond the Standard Model.
- Beauty - Where is the antimatter?

## Software testing

Albert@home - Testing project for Einstein@Home

RALPH@home - Test project for Rosetta@home

SETI@home Beta - Test project of SETI@home

YAFU - Test BOINC server software, integer factorization

Pirates@Home - Always under development, so please don't expect it to work all the time; in fact, right now we have very little work, just occasional tests

## Software testing - Chess engines

Fishtest - Validates patches to the Stockfish chess engine by playing thousands of chess games at fast time controls between different versions of the engine

Leela Chess Zero - Trains chess neural-networks with deep reinforcement learning, experiments with training parameters and net architectures

## Statistics

WUProp@Home - Collect various statistics about other BOINC projects

## Others

1. CAS@home - A Multi-Application project in Biochemistry, Physics etc. [4)]
2. Citizen Science Grid - The project is dedicated to supporting a wide range of research and educational projects
3. SETI@home - SETI@home project, Search for Extraterrestrial Intelligence
4. TN-Grid - Research in various scientific projects
5. World Community Grid - Research includes HIV/AIDS, cancer, muscular dystrophy, dengue fever, and many more [5)]
6. Yoyo@home - Brings existing distributed computing projects to the Boinc world using the Boinc Wrapper technology [6)]

## Projects

| |
|---|
| EDGeS@Home |
| SZTAKI Desktop Grid |
| The Lattice Project |
| World Community Grid |
| DIMES |
| Majestic-12 |

| |
|---|
| NESSI-GRID |
| OMII-UK |
| Storage@home |
| StrataGenie |
| Surveill@Home |

## Infrastructure (1)

BREIN uses the Semantic Web and multi-agent systems to build simple and reliable grid systems for business, with a focus on engineering and logistics management

A-Ware is developing a stable, supported, commercially exploitable, high quality technology to give easy access to grid resources

AssessGrid addresses obstacles to wide adoption of grid technologies by bringing risk management and assessment to this field, enabling use of grid computing in business and society

Cohesion Platform is a Java-based modular peer-to-peer multi-application desktop grid computing platform for irregularly structured problems developed at the University of Tübingen (Germany)

## Infrastructure (2)

The European Grid Infrastructure (EGI) is a series of projects funded by the European Commission which links over 70 institutions in 27 European countries to form a multi-science computing grid infrastructure for the European Research Area, letting researchers share computer resources

GridCOMP provides an advanced component platform for an effective invisible grid

GridECON takes a user-oriented perspective and creates solutions to grid challenges to promote widespread use of grids

neuGRID develops a new user-friendly grid-based research e-infrastructure enabling the European neuroscience community to perform research needed for the pressing study of degenerative brain diseases, for example, Alzheimer's disease

# Infrastructure (3)

OMII-Europe is an EU-funded project established to source key software components that can interoperate across several heterogeneous grid middleware platforms

OurGrid aims to deliver grid technology that can be used today by current users to solve present problems. To achieve this goal, it uses a different trade-off compared to most grid projects: it forfeits supporting arbitrary applications in favor of supporting only bag-of-tasks applications

# Infrastructure (4)

ScottNet NCG is a distributed neural computing grid. A private commercial effort in continuous operation since 1995. This system performs a series of functions including data synchronization amongst databases, mainframe systems, and other data repositories. E-commerce transaction processing, automated research and data retrieval, content analysis, web site monitoring, scripted and dynamic user emulation, shipping and fulfillment API integration and management, RSS and NNTP monitoring and analysis, real time security enforcement, and backup/restore functions.

# Infrastructure (5)

BEinGRID - Business Experiments in Grid

Legion is a grid computing platform developed at the University of Virginia

Berkeley NOW Project

Debian Cluster Components

DiaGrid is a grid computing network centered at Purdue University

Open Science Grid

SARA Computing and Networking Services in Netherlands

The Extreme Science and Engineering Discovery Environment (XSEDE) - formerly Teragrid

# References


1. https://en.m.wikipedia.org/wiki/List_of_distributed_computing_projects
2. https://boinc.berkeley.edu/wiki/Category:Projects / https://boinc.berkeley.edu/wiki/Project_list / https://boinc.berkeley.edu/projects.php
3. https://en.wikipedia.org/wiki/List_of_citizen_science_projects
4. https://boinc.berkeley.edu/wiki/Publications_by_BOINC_projects
5. https://www.boincitaly.org/progetti/pubblicazioni-scientifiche.html#en


1)

Cancer research

2)

Analyse ways to improve climate prediction models - Climate Study

3)

Zooniverse - 3 literature projects

4)

Encourage Chinese scientists to use volunteer computing for their research

5)

To further critical non-profit research on some of humanity's most pressing problems by creating the world's largest volunteer computing grid

6)

Data structure analysis to help prove a conjecture, elliptic curve factorization, pion creation in a particle accelerator, evolution research, find the shortest optimal Golomb ruler of length 28

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