

Clinical and Research Data Warehouse (CRDW)

Branimir Ljubic

Office of Advanced Research Computing (OARC), Rutgers

CRDW - Support

Web: crdw.rutgers.edu

Contact email: crdw_requests@oarc.rutgers.edu

CRDW – OARC Team



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OARC RUTGERS



OFFICE OF ADVANCED RESEARCH COMPUTING / RESOURCES / GRANT PROPOSALS AND SPONSORED PROJECTS

Grant Proposals and Sponsored Projects

OARC offers grant-submission support, awarded-project research collaboration, and research-computing equipment for award use. OARC pursues and has been awarded equipment grants to increase resources for the benefit of the entire university. It also partners on awards with other schools, departments, and researchers.

Sponsored Projects

(As of Thursday, May 30, 2024)

\$18,291,549

Total departmental dollars awarded (equipment/hardware for the university)

\$130,607,546

Total collaborative funds awarded

\$144,157,266

Total current/pending proposals



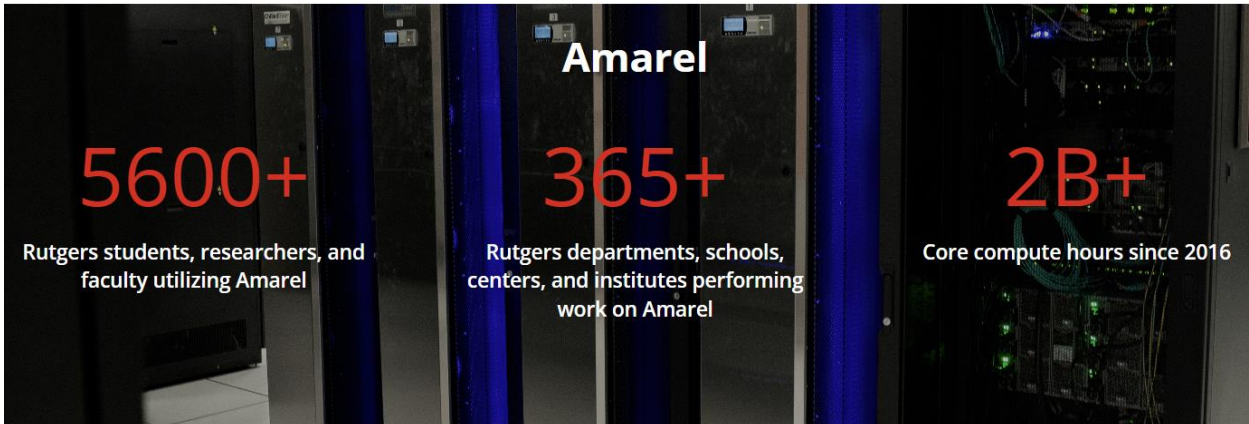
Research and Education Facilitator Team (REF's)

OARC's team of experienced computational scientists act as the bridge between central IT and the research community. We call this team the "REF's," an HPC community-accepted term for the role of Research and Education Facilitator. These domain specialists are available to support you in:

The Office of Advanced Research Computing (OARC) is the university's centralized research computing and data science resource.

OARC provides Rutgers researchers with essential computing, networking, storage, and data-handling capabilities, and students with necessary exposure, training, and education.

REF (Research and Education Facilitator) scientists provide support in many scientific areas.



Mid 2024:

- 770 compute nodes
 - 37,472 Intel Xeon cores
 - 248 GPUs
 - Open OnDemand servers
 - InfiniBand FDR & EDR fabric

Compute nodes include the following:

- 2x [Intel Xeon Gold 6448Y \(Sapphire Rapids\) Processors](#) (60MB cache, 2.1GHz), 4800 MHz DDR5 memory, 32-core processors (64 cores/node)
- 16x16GB DIMMs (256GB/node)
- 480GB SSD on-board drive
- 25GigE and Infiniband HDR (100Gb/s) adapters
- The cost of node ownership is \$9,763 per node
- A limited number of 4x L40S NVIDIA GPUs are also available at \$35,853
- The cost of node ownership is based upon a four-year fully warrantied node lifetime. New owners receive 1 complimentary terabyte of storage with their first purchase. Additional /project storage space is currently offered at \$150/TB for Amarel owners.

JUMP TO: [THE AMAREL MODEL](#) [FEATURED USE CASES](#) [ACCESS TO AMAREL](#) [CURRENT HARDWARE](#)

- In July 2017, the OARC unveiled Amarel,
- Named in honor of **Dr. Saul Amarel**, one of the founders of the Rutgers Computer Science Department
- Advanced computing environment, HPC computing, large memory systems, data analytics, artificial intelligence (AI) research, etc.
- The Amarel cluster spans three Rutgers data centers (Piscataway, Newark, and Camden)

Supporting projects many scientific areas including Health Sciences:

- CRDW
- REDCap
- Research Data Storage
- Medical Informatics
- Data Science in Medicine
- Machine learning
- AlphaFold, etc.

Provide Education and Training:



Certificate in Clinical Informatics and Data Science: 3 Digital Badges

This program is offered at no cost to students from the **New Jersey Alliance for Clinical and Translational Science**. Designed for students who are already professionally engaged in health care or public health and want to improve their technical skills, the **certificate in Clinical Informatics and Data Science** will be granted upon the completion of a digital three badge sequence in the process and methods of machine learning as used in clinical research and reporting.

<https://njacts.rbhs.rutgers.edu/education-training/workforce-development/certificate-in-clinical-informatics-and-data-science/>

CRDW - Website

Clinical and Research Data Warehouse (CRDW)

A secure, HIPAA-compliant central repository that includes diverse healthcare data and essential analytical tools for gaining insights into medical conditions, outcomes, and treatments.

crdw.rutgers.edu

Statement from Michele Norin, Senior Vice President and Chief Information Officer at Rutgers:
 “As a direct outcome of the partnership between Rutgers Health and RWJBarnabas, this has truly been a collaborative effort involving many individuals from across our organizations. Very specifically, we recognize the innovation, effort, creativity, and leadership invested by the team at Rutgers Cancer Institute of New Jersey (CINJ) in developing the [first-generation multimodal clinical and research data warehouse](#), automated ETL (extract, transform, load) interface, and mining tools that became the foundation for the enterprise-level CRDW environment. Because of the efforts by all involved, the CRDW is expected to become an invaluable resource to our academic healthcare enterprise.”

What is CRDW:
 The Rutgers Clinical and Research Data Warehouse (CRDW) serves as a central repository, uniting diverse healthcare data sources including Electronic Medical Records (EMRs), Clinical Trial Management System (CTMS), Tumor Registries, Biospecimen Repositories, and cutting-edge medical imaging and genomics.

CRDW – Current Sponsors



Barnabas Health



New Jersey Alliance for Clinical and
Translational Science



Rutgers Health

CRDW – Data

1. **EHR Epic Clarity Database – Managed by the Rutgers EARC - CRDW team**
2. IFH (Institute for Health) Collection of Medicaid / Medicare and other datasets -
Managed by IFH
The catalog link: <https://ifhcore.rutgers.edu/data>
3. CINJ provides older collection of cancer related data, ARIA and some radiology images – managed by CINJ

The vision is to bring everyone together under one roof of the CRDW in the future.

CRDW FEASIBILITY TOOL

What's in the CRDW as of **January 2024**

1900

First ENCOUNTER YEAR

2110

Last ENCOUNTER DATE

8.23M

of Patients in CRDW

3.91M

of Male Patients

4.32M

of Female Patients

4,594

of Unknown

96

of Non-Binary Pa...

132

of X Gender

53.84M

Total Encounter

Alive

8,169,051

Deceased

59,397

Has Cancer YN?

(Blank)

6,663,030

N

1,510,994

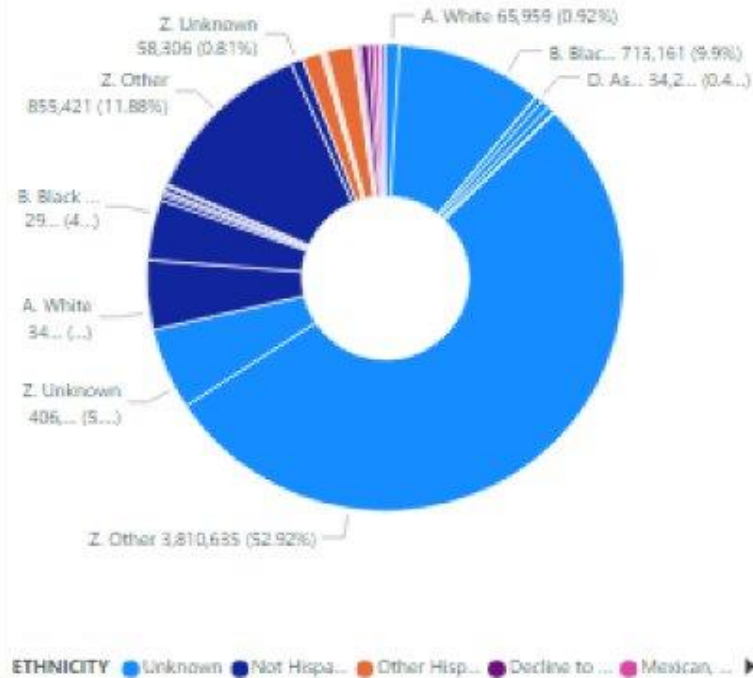
Distinct Dx Group Count

218

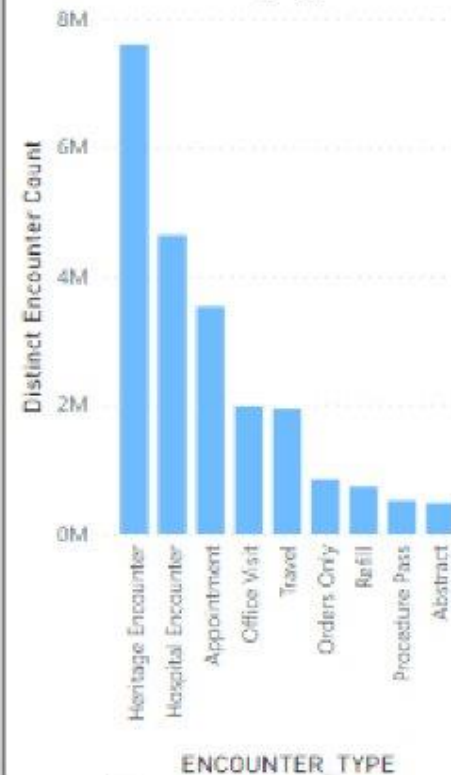
Distinct Dx Count

203.71K

Distinct Patient by Ethnicity and Race



Encounter Count by Type



Top20 ICD10 Codes

ICD10 Code	Total Distinct Patients
E11.9	271,498
E66.9	194,743
E78.00	247,260
E78.2	206,899
E78.5	419,581
F41.9	196,282
I10	865,815
I25.10	231,547
K21.9	218,543
R05.9	234,776
R06.02	212,068
R07.9	261,612
R10.9	241,028
R51.9	204,229
Z00.00	524,458
Z01.818	207,282
Z12.31	282,242
Z20.822	374,898
Z23	630,081
Total	6,420,237

332

Location

2104

Department

132

Specialty

84

Encounter Type

CRDW EHR Data – Basic facts

- Oracle SQL database
- Epic Clarity data, mostly from RWJBarnabas Health (2018 – current)
- More than 8.5 million distinct patients
- 2.3 million annual patient visits during 2023 to RWJBH
- CRDW update – full update every 3 months (most used tables monthly)
- **Caution:** Dataset delivered today and updated 6 months later could be different
- Since the official launch of the CRDW in January 2024, CRDW team processed and delivered more than 20 projects to researchers, a remarkable increase from only two projects delivered over the previous four years.

CRDW – Access Requirements

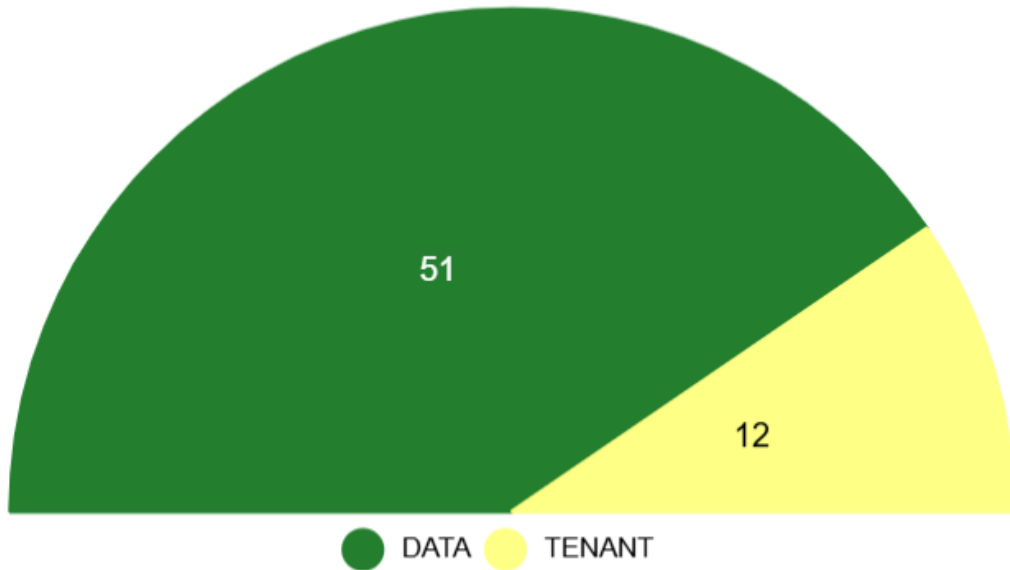
- Access is granted to authorized researchers, clinicians, and stakeholders associated with Rutgers University and RWJBH, as well as their [partner institutions \(Princeton, NJIT, etc.\)](#)*.
- Researchers must first get approval from the Institutional Review Board (IRB) for their research projects before applying for CRDW access.
- Approval from the CRDW Data Governance Council (DGC) is necessary.
- * [PI must be associated with Rutgers University or RWJBH, and the PI will be responsible for proper data management with their external partners](#)

CRDW – Services

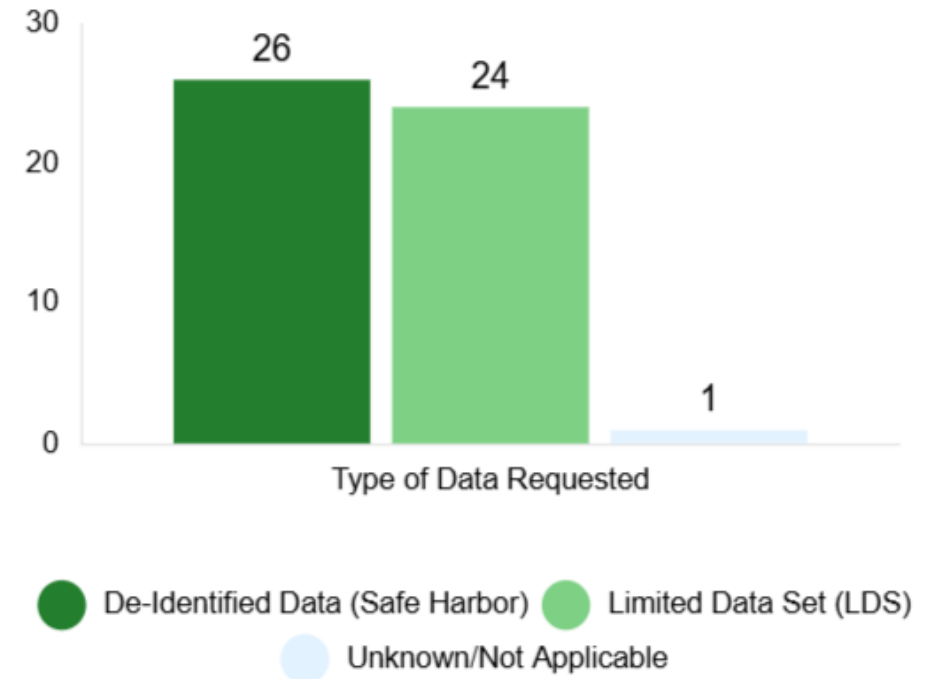
- **CRDW provides two types of data services:**
- **Data Access:** Researchers can request access to data already stored in the CRDW warehouse.
- **Data Tenancy:** If researchers need to transfer their own data into the protected CRDW environment. We currently prioritize projects with clinical and medical data for tenancy requests.
- In addition to data access and hosting services, CRDW offers **research support** ranging from basic analytical consultations and initial assessment of the available clinical data to comprehensive examination of data to identify trends and patterns, data mining machine learning, and predictive modeling.

CRDW – Requests by Type

ALL CRDW REQUESTS BY TYPE



DATA REQUESTS BY TYPE



Data Request Purpose

- Clinical Study
- Statistical analysis
- Machine Learning
- Social Networks Analysis (Graphs)
- Data Mining and Knowledge Extraction

Data Request - Steps

- Consultation with the CRDW Analytics team
- Data request on the CRDW website
- IRB approval
- Data Governance Council (DGC) approval
- Data search and extraction
- Data Transfer
- Virtual Machine (VM) installation and data transfer
- Data Transfer to other resources (Amarel)
- Data analytics on VMs
- Fees

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- crdw.rutgers.edu

Get started with CRDW

Data access form
Need access to data hosted in CRDW? Submit your request via the following form.
[Data request](#)

Tenant request form
Want to host your own data from a project in CRDW? Complete the tenant request form.
[Tenant request](#)

Consultation request form
Need a consultation with CRDW staff scientists? Submit your request through the following form.
[Consultation request](#)

Contact us
Submit any questions regarding CRDW services by sending an email to crdw_requests@oarc.rutgers.edu.

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IRB Approval

- <https://eirb.rutgers.edu/>
- IRB Submission help: IRBOffice@research.rutgers.edu



The screenshot shows the eIRB+ website interface. At the top, there is a navigation bar with the Rutgers University logo and the text "RUTGERS UNIVERSITY Office for Research" on the left, and "eIRB+" on the right. Below this is a dark blue navigation bar with a red "Home" button. The main content area is divided into two columns. The left column, titled "eIRB Support", lists contact information for IRB Submission Help, IT Tech Support, Virtual Office Hours, and eIRB Training Workshops. The right column, titled "eIRB+ Training Workshop", features a green background with a welcome message and a link to quick guides.

R | RUTGERS UNIVERSITY
Office for Research

eIRB+

Home

eIRB Support

IRB Submission Help:
IRBOffice@research.rutgers.edu

IT Tech Support:
eirb@research.rutgers.edu

Virtual Office Hours

Tuesdays, 1:00pm – 1:30pm

Thursdays, 10:00am – 10:30am

eIRB Training Workshops

HRPP/IRB Educational Resources | Rutgers Research

eIRB+ Training Workshop

Welcome to the new eIRB+ system!

For additional guidance, eIRB+ Quick Guides are available: <https://research.rutgers.edu/eirb-quick-guides>

HRPP is hosting eIRB+ training workshops to get you up to speed on our new eIRB+ system.

Please register using the link provided below:
<https://crs.research.rutgers.edu>

IRB Approval

- **IRB Submission Type and Recommendation Tool**
 - If data are identifiable – LDS (Limited Data Set)
 - Qualtrics-based tool developed by the Rutgers IRB
 - Series of questions to provide recommendations on which eIRB+ application type and consent templates (if applicable) to use in their human subjects research submissions.
 - It also provides insights into the level of IRB Review that the study may qualify for and information about the applicability of consent/HIPAA Authorization waivers.
- **Non-Human Research Self-Certification Tool (HRP-310b)**
 - De-identified data

De-Identified data –

The following are the 18 PHI (Protected health information) identifiers we should consider removing:

1. Names
2. All geographic elements
3. All elements of dates (except year)
4. Telephone number
5. Vehicle identifiers and serial numbers, including license plate numbers
6. Fax numbers
7. Device identifiers and serial numbers
8. Email addresses
9. Web Universal Resource Locators (URLs)
10. Social security numbers
11. Internet Protocol (IP) addresses
12. Medical record numbers
13. Biometric identifiers, including finger and voice prints
14. Health plan beneficiary numbers
15. Full-face photographs and any comparable images
16. Account numbers
17. Any other unique identifying number, characteristic, or code
18. Certificate/license numbers

<https://www.govinfo.gov/content/pkg/CFR-2022-title45-vol2/pdf/CFR-2022-title45-vol2-sec164-514.pdf>

Part 2: Scenarios 1-8

Instructions:

In the next section, you will be presented with 8 scenarios.

- Select "**Matches**" if the scenario matches your project.
- Select "**Does Not Match**" if the scenario does not match your project.

Scenario 1: The scenario matches my project activities:

Project does not propose to obtain the following for Human Research purposes:

- (a) information (data) through intervention or interactions with living individuals and use, study, or analyze the information; or
- (b) uses, studies, analyzes, or generates identifiable private information (data).

Note: For Quality Activities (such as Quality Assurance (QA), Quality Improvement (QI), Continuous Quality Improvement (CQI), Program Evaluation (PE), Ev
These activities will be addressed later in this form. Learn more about Quality Activities and their requirements: <https://research.rutgers.edu/faculty-staff/comp>

- Matches
- Does Not Match

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DocuSign

DocuSign is a secure electronic signature tool that verifies, routes, tracks, and stores documents requiring signatures.

Email notification



Vlad Kholodovych sent you a document to review and sign.

REVIEW DOCUMENTS

Data Access and Use Agreement (DUA)

EXHIBIT B

CONFIDENTIAL

RESEARCHER DATA ACCESS AND USE AGREEMENT ("Agreement") Rutgers and/or RWJBH Employee Researcher Use Only

Researcher:	Agreement Term:
Researcher Contact Information:	Start Date:
Researcher Employer/School (check one only): Rutgers, The State University RWJBH Facility	End Date:
	Data (check one only): Deidentified Data Limited Data Set Data

Agreement Terms and Conditions

1. Rutgers, The State University ("Rutgers") maintains a Clinical Research Data Warehouse ("CRDW") that stores certain patient and other confidential data of RWJBH Corporate Services, Inc. and its facilities ("RWJBH") ("RWJBH Data") and Rutgers ("Rutgers Data"), respectively. The RWJBH Data and Rutgers Data is collectively referred to as the "Database", which Database is made available to researchers for the purpose of facilitating permitted research functions with Data Governance Council ("DGC") approval. Researcher is an employee of the Research Employer indicated above and wishes to access the Database for research purposes that further the academic research goals of Rutgers and RWJBH. Subject to all Rutgers and DGC required approvals, Rutgers will provide Researcher access to the research data set described in Attachment 1 (the "Data") solely for the research purpose set forth in Attachment 1 (the "Research Project"). RWJBH and Rutgers, each, shall retain ownership of any rights they may have in the Data, and Researcher does not obtain any rights in the Data other than those expressly set forth herein.

2. Researcher shall not use the Data except as authorized under this Agreement. The Data will be used solely to conduct the Research Project and solely by Researcher and Researcher's authorized designees ("Researcher Personnel") and Collaborator Personnel (as defined in Attachment 3) that have a need to use, or provide a service in respect of, the Data in connection with the Research Project and whose obligations of use are limited by and in accordance with this Agreement (collectively, "Authorized Persons"). In the event Collaborator Personnel require access to the Data, Researcher shall require that the Collaborator institution first execute an agreement with Research Employer with terms substantially similar to those set forth in this Agreement.

3. Except as authorized under this Agreement or otherwise required by applicable law, Researcher agrees to retain control over the Data and shall not disclose, release, sell, rent, lease, loan, or otherwise grant access to the Data to any third party, except Authorized Persons. Researcher agrees to establish appropriate administrative, technical, and physical safeguards to prevent unauthorized use of or access to the Data and comply with any other special requirements relating to safeguarding of the Data as may be set forth in Attachment 2.

4. Researcher agrees on behalf of itself and its Researcher Personnel, and Authorized Persons, to use and limit the use of the Data in compliance with all applicable laws, rules, and regulations, Rutgers policies and procedures, as well as all professional standards applicable to such research.

5. Researcher is encouraged to make publicly available the results of the Research Project, ensuring that any paper or abstract does not include confidential or proprietary information. Before Researcher submits a paper or abstract for publication or otherwise intends to publicly disclose information about the results of the Research Project, the DGC will have thirty (30) days from receipt to review proposed manuscripts and ten (10) days from receipt to review proposed abstracts to ensure that the Data is appropriately protected. DGC may request in writing that the proposed publication or other disclosure be delayed for up to thirty (30) additional days as necessary to protect proprietary information.

Storage and Compute Configuration (SCA)

CRDW Storage and Compute Components Configuration Agreement

Researcher Name:
Project Title:

CRDW Project ID: **IRB approval number:**

This agreement outlines the configuration and specifications for the Storage and Compute components of the CRDW virtual machine (VM) environment. Detailed information regarding the virtual hardware specifications, operating system (OS) version and settings, network settings, local storage configuration, accessible data shares, installed software, and software configuration are provided below. This agreement is effective upon signature and shall remain valid for the indicated duration of the project after which disposition procedures specified in Disposition Requirement section will be followed. This agreement may be amended by mutual consent of the parties involved.

READ, ACKNOWLEDGED AND ACCEPTED by RESEARCHER		APPROVED AND AGREED by CRDW CORE DIRECTOR	
Name		Name	
Title:		Title:	
Signature:	Date:	Signature:	Date:

Data Storage

How much disk space do you require to store your data, including the initial set and the results of your calculations?

Project Timeframe

Start date: **End date:**

Disposition Requirements (often based on IRB approval details)

Here is an example: We expect to continue using this VM, unmodified, for 6 months from initial provisioning. Afterward, we may shift to an updated or differently configured VM. Upon completion of the project all data and compute and storage components associated with this VM will be securely destroyed in accordance with data disposition policies. This VM can then be removed from service (retired).

VM hardware (select one):

Standard VM: (4 vCPU cores with 16 GB RAM and 40 GB hard drive space)

Cost Estimation

Cost Estimation for the project in Rutgers CRDW

Researcher Name:

Researcher Title:

Project Title:

Business Contact (for billing):
(Name/email/phone)

Date:

Signature:

SKU Name	Service Description	Term	Rate	Amount	SKU Units	Cost, \$
Data extraction (ETL) and Data transfer						
CRDW4	Data extraction (ETL)	hours	\$/hour			
CRDW5	Data transfer (in/out)	hours	\$/hour			
Computation						
VM1	Standard virtual machine	days	\$/hour			
VM1	Custom virtual machine	days	\$/hour			
BM1	Bare metal CPU-only node	days	\$/hour			
Data storage						
CRDW8	Encrypted object storage, Isilon (files)	days	\$/1TB/month			
CRDW10	Encrypted block storage (databases)	days	\$/1TB/month			
Project Cost:						

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Data Request - Example

Project:

Hypertension and comorbidities
(Diabetes Mellitus, Chronic Heart Failure, Asthma, COPD, Dementia, Atrial Fibrillation)

Objectives:

Machine learning, Social Networks Analysis, Clustering, etc.

Description of the Project	Generate a deidentified dataset for use in the teaching of clinical informatics and machine learning to students in the NJACTS badge program
Disposition Requirements	Our plan is to let the students use this dataset to learn machine learning and data science methods for as long as possible. Students will be asked to design their own research question using the features available.
Patient Data Collection	include: patients 18-70 as of 1/1/2021 with hypertension (any type) and at least one of diabetes I or II, CHF, asthma, COPD, dementia (any type), or atrial fibrillation and at least 4 visits in the 3 study years exclude: gestational diabetes
Notes	Data must be completely deidentified. Since this may be a very large dataset, please cap at 35,000 patients and sample as appropriate.
Project Duration	open ended
Stratification/Classification Desired for Results	comorbidity diagnosis

Suggested Data Search Options for CRDW Requests

- **Diagnosis** (ICD 10, ICD 9, Name, etc.)
- **Procedures** (Current Procedural Terminology (CPT)/Healthcare Common Procedure Coding System (HCPCS) Codes, ICD 10, Name...)
- **Medications** (NDC (national drug codes), GPI (generic product identifier), Names, etc.)
- **Labs** (Names, Numeric values, etc.)

ICD 10 codes (also ICD 9 codes or Diagnosis_Name)

Codes

- [I10](#) Essential (primary) hypertension
- [I11](#) Hypertensive heart disease
- [I12](#) Hypertensive chronic kidney disease
- [I13](#) Hypertensive heart and chronic kidney disease
- [I15](#) Secondary hypertension
- [I16](#) Hypertensive crisis
- [I1A](#) Other hypertension

Codes

- [J40](#) Bronchitis, not specified as acute or chronic
- [J41](#) Simple and mucopurulent chronic bronchitis
- [J42](#) Unspecified chronic bronchitis
- [J43](#) Emphysema
- [J44](#) Other chronic obstructive pulmonary disease
- [J45](#) Asthma
- [J47](#) Bronchiectasis
- [J4A](#) Chronic lung allograft dysfunction

Codes

- [E08](#) Diabetes mellitus due to underlying condition
- [E09](#) Drug or chemical induced diabetes mellitus
- [E10](#) Type 1 diabetes mellitus
- [E11](#) Type 2 diabetes mellitus
- [E13](#) Other specified diabetes mellitus

Codes

- ▶ [I50](#) Heart failure
 - ▶ [I50.1](#) Left ventricular failure, unspecified
 - ▶ [I50.2](#) Systolic (congestive) heart failure
 - ▶ [I50.20](#) Unspecified systolic (congestive) heart failure
 - ▶ [I50.21](#) Acute systolic (congestive) heart failure
 - ▶ [I50.22](#) Chronic systolic (congestive) heart failure
 - ▶ [I50.23](#) Acute on chronic systolic (congestive) heart failure
 - ▶ [I50.3](#) Diastolic (congestive) heart failure
 - ▶ [I50.30](#) Unspecified diastolic (congestive) heart failure
 - ▶ [I50.31](#) Acute diastolic (congestive) heart failure
 - ▶ [I50.32](#) Chronic diastolic (congestive) heart failure
 - ▶ [I50.33](#) Acute on chronic diastolic (congestive) heart failure
 - ▶ [I50.4](#) Combined systolic (congestive) and diastolic (congestive) heart failure
 - ▶ [I50.40](#) Unspecified combined systolic (congestive) and diastolic (congestive) heart failure
 - ▶ [I50.41](#) Acute combined systolic (congestive) and diastolic (congestive) heart failure
 - ▶ [I50.42](#) Chronic combined systolic (congestive) and diastolic (congestive) heart failure
 - ▶ [I50.43](#) Acute on chronic combined systolic (congestive) and diastolic (congestive) heart failure
 - ▶ [I50.8](#) Other heart failure

Query ICD 10 codes:

(I10 OR I15*) AND (E10 OR E11 OR I50.22 OR J44 OR J45)

Query text:

[(Essential hypertension) OR (secondary hypertension)] AND [(Diabetes Mellitus 1) OR (Diabetes Mellitus 2) OR (Chronic systolic (congestive) heart failure) OR (COPD) OR (Asthma)]

NDC codes, GPI codes and also medication IDs

Hypertension AND Lisinopril (ACE-inhibitor) (2.5mg, 5mg, 10mg, 20mg, etc.)

Diabetes Mellitus Type 2 AND Ozempic (Semaglutide) (0.5mg, 1mg, 2mg)

Worksheet Query Builder

```
select distinct m.medication_id,c.*,m.* from data_clarity.clarity_medication m
inner join data_clarity.clarity_NDC_CODES c on c.medication_id = m.medication_id where m.name like '%LISINOPRIL%'

select * from data_clarity.clarity_NDC_CODES where ndc_code like '50090%'
```

Query Result X

SQL | Fetched 50 rows in 0.031seconds

NDC_CODE	CM_PHY_OWNER_ID	CM_LOG_OWNER_ID	MEDICATION_ID_2	NAME	THERA_CLASS_C	PHARM_CLASS_C	PHARM_SUBCLASS_C	SIMPLE_GENERIC_C	COST	GENERIC_NAME	GPI	STRENGTH	FORM	ROUTE	CONTROLLED_MED_YN	DEA_CLASS
1 23155-879-01	(null)	(null)	4526	LISINOPRIL 20 MG TABLET	26	9	188118	(null)	lisinopril 20 mg tablet 183474 20 mg	tablet oral	(null)					
2 23155-879-10	(null)	(null)	4526	LISINOPRIL 20 MG TABLET	26	9	188118	(null)	lisinopril 20 mg tablet 183474 20 mg	tablet oral	(null)					
3 31722-178-01	(null)	(null)	4526	LISINOPRIL 20 MG TABLET	26	9	188118	(null)	lisinopril 20 mg tablet 183474 20 mg	tablet oral	(null)					
4 31722-178-10	(null)	(null)	4526	LISINOPRIL 20 MG TABLET	26	9	188118	(null)	lisinopril 20 mg tablet 183474 20 mg	tablet oral	(null)					
5 43063-786-14	(null)	(null)	4526	LISINOPRIL 20 MG TABLET	26	9	188118	(null)	lisinopril 20 mg tablet 183474 20 mg	tablet oral	(null)					
6 43063-786-30	(null)	(null)	4526	LISINOPRIL 20 MG TABLET	26	9	188118	(null)	lisinopril 20 mg tablet 183474 20 mg	tablet oral	(null)					
7 43063-786-60	(null)	(null)	4526	LISINOPRIL 20 MG TABLET	26	9	188118	(null)	lisinopril 20 mg tablet 183474 20 mg	tablet oral	(null)					
8 43063-786-90	(null)	(null)	4526	LISINOPRIL 20 MG TABLET	26	9	188118	(null)	lisinopril 20 mg tablet 183474 20 mg	tablet oral	(null)					
9 43063-786-93	(null)	(null)	4526	LISINOPRIL 20 MG TABLET	26	9	188118	(null)	lisinopril 20 mg tablet 183474 20 mg	tablet oral	(null)					
10 43063-786-98	(null)	(null)	4526	LISINOPRIL 20 MG TABLET	26	9	188118	(null)	lisinopril 20 mg tablet 183474 20 mg	tablet oral	(null)					
11 43063-813-01	(null)	(null)	4526	LISINOPRIL 20 MG TABLET	26	9	188118	(null)	lisinopril 20 mg tablet 183474 20 mg	tablet oral	(null)					
12 43063-813-14	(null)	(null)	4526	LISINOPRIL 20 MG TABLET	26	9	188118	(null)	lisinopril 20 mg tablet 183474 20 mg	tablet oral	(null)					
13 43063-813-30	(null)	(null)	4526	LISINOPRIL 20 MG TABLET	26	9	188118	(null)	lisinopril 20 mg tablet 183474 20 mg	tablet oral	(null)					
14 43063-813-60	(null)	(null)	4526	LISINOPRIL 20 MG TABLET	26	9	188118	(null)	lisinopril 20 mg tablet 183474 20 mg	tablet oral	(null)					
15 43063-813-90	(null)	(null)	4526	LISINOPRIL 20 MG TABLET	26	9	188118	(null)	lisinopril 20 mg tablet 183474 20 mg	tablet oral	(null)					
16 43063-813-93	(null)	(null)	4526	LISINOPRIL 20 MG TABLET	26	9	188118	(null)	lisinopril 20 mg tablet 183474 20 mg	tablet oral	(null)					
17 43063-813-98	(null)	(null)	4526	LISINOPRIL 20 MG TABLET	26	9	188118	(null)	lisinopril 20 mg tablet 183474 20 mg	tablet oral	(null)					
18 43353-271-30	(null)	(null)	4526	LISINOPRIL 20 MG TABLET	26	9	188118	(null)	lisinopril 20 mg tablet 183474 20 mg	tablet oral	(null)					
19 43353-271-45	(null)	(null)	4526	LISINOPRIL 20 MG TABLET	26	9	188118	(null)	lisinopril 20 mg tablet 183474 20 mg	tablet oral	(null)					
20 43353-271-60	(null)	(null)	4526	LISINOPRIL 20 MG TABLET	26	9	188118	(null)	lisinopril 20 mg tablet 183474 20 mg	tablet oral	(null)					
21 43353-271-80	(null)	(null)	4526	LISINOPRIL 20 MG TABLET	26	9	188118	(null)	lisinopril 20 mg tablet 183474 20 mg	tablet oral	(null)					
22 43353-297-30	(null)	(null)	4526	LISINOPRIL 20 MG TABLET	26	9	188118	(null)	lisinopril 20 mg tablet 183474 20 mg	tablet oral	(null)					
23 43353-297-45	(null)	(null)	4526	LISINOPRIL 20 MG TABLET	26	9	188118	(null)	lisinopril 20 mg tablet 183474 20 mg	tablet oral	(null)					
24 43353-297-60	(null)	(null)	4526	LISINOPRIL 20 MG TABLET	26	9	188118	(null)	lisinopril 20 mg tablet 183474 20 mg	tablet oral	(null)					
25 43353-297-80	(null)	(null)	4526	LISINOPRIL 20 MG TABLET	26	9	188118	(null)	lisinopril 20 mg tablet 183474 20 mg	tablet oral	(null)					
26 43547-354-10	(null)	(null)	4526	LISINOPRIL 20 MG TABLET	26	9	188118	(null)	lisinopril 20 mg tablet 183474 20 mg	tablet oral	(null)					
27 43547-354-11	(null)	(null)	4526	LISINOPRIL 20 MG TABLET	26	9	188118	(null)	lisinopril 20 mg tablet 183474 20 mg	tablet oral	(null)					
28 43547-417-10	(null)	(null)	4526	LISINOPRIL 20 MG TABLET	26	9	188118	(null)	lisinopril 20 mg tablet 183474 20 mg	tablet oral	(null)					
29 43547-417-11	(null)	(null)	4526	LISINOPRIL 20 MG TABLET	26	9	188118	(null)	lisinopril 20 mg tablet 183474 20 mg	tablet oral	(null)					
30 43063-786-9	(null)	(null)	4526	LISINOPRIL 20 MG TABLET	26	9	188118	(null)	lisinopril 20 mg tablet 183474 20 mg	tablet oral	(null)					

Labs and Other Parameters

Diabetes Mellitus type 2 **and** **A1C level**

Diabetes Mellitus type 2 **and** **Blood Glucose level above 183 mg/dL (10.2 mmol/L)**

Age

(examples: Between 45 and 65, Above 65, Below 30, etc.)

Sex

Male or Female

BIRTH_DATE	SEX	AGE	ORD_NUM_VALUE	REFERENCE_UNIT
26-MAR-58	AM Female	66.63709677419354838709677419354838709675	163.0	mg/dL
26-MAR-58	AM Female	66.63709677419354838709677419354838709675	119.0	mg/dL
26-MAR-58	AM Female	66.63709677419354838709677419354838709675	134.0	mg/dL
26-MAR-58	AM Female	66.63709677419354838709677419354838709675	116.0	mg/dL
26-MAR-58	AM Female	66.63709677419354838709677419354838709675	193.0	mg/dL

Search Query Strategy

Limit to patients who had 2 or more visits to doctors (hospital, medical practice, etc.)

Limit to a particular Time Frame (example: 2018 – 2021)

Limit to a certain age group (45 – 65)

Limit to a particular sex (male, female, etc.)

Limit to a particular institutions (RWJBH)

Query examples:

(Diabetes Mellitus type 2) AND (A1C level) AND (Age between 45 – 65)

(Diabetes Mellitus type 2) AND (Blood Glucose level above 183 mg/dL (10.2 mmol/L)) AND (Female)

Data Request - Steps

- Consultation with the CRDW Analytics team
- Data request on the CRDW website
- IRB approval
- Data Governance Council (DGC) approval
- Data search and extraction
- **Data Transfer**
- **Virtual Machine (VM) installation and data transfer**
- Data Transfer to other resources (Amarel)
- Data analytics on VMs
- Fees



Citrix – Virtual Machines



<https://ctx.rutgers.edu>

Rutgers Citrix Access

Please log on

NetID:

Password:

Log On



citrix | StoreFront



Apps

All (1)

Favorites (0)



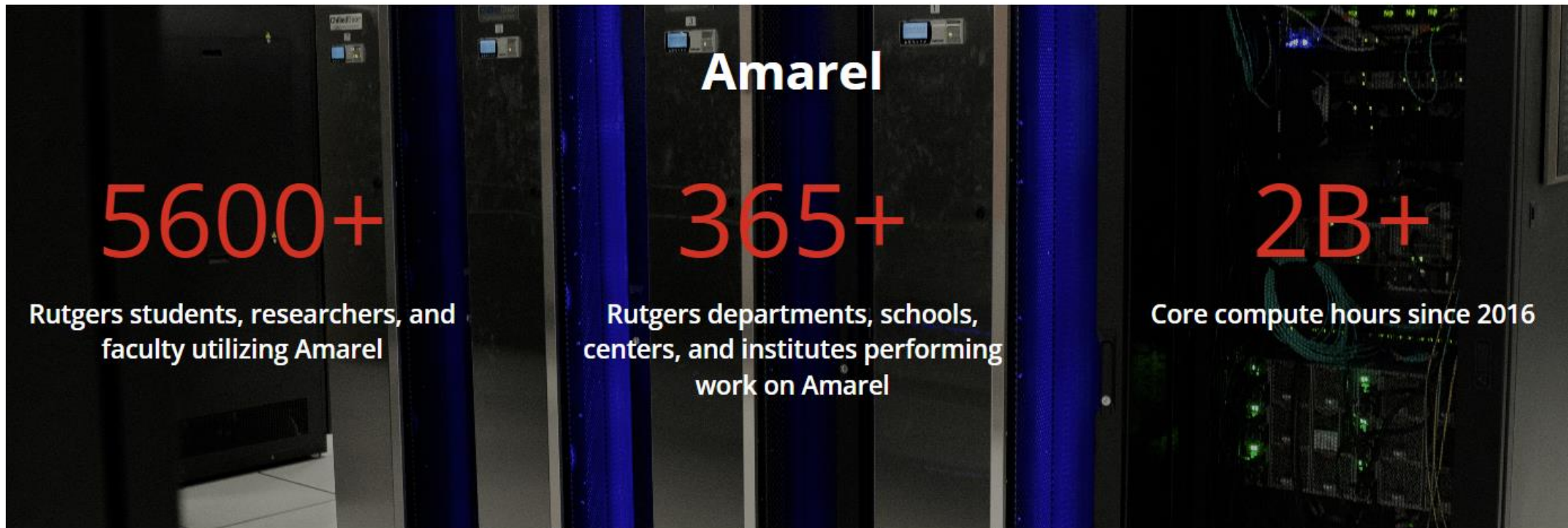
CRDW Analytical Desktop



Windows VM or Linux VM

Data Request - Steps

- Consultation with the CRDW Analytics team
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- Data search and extraction
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- Data analytics on VMs
- Fees



JUMP TO:

THE AMAREL MODEL

FEATURED USE CASES

ACCESS TO AMAREL

CURRENT HARDWARE

[Request an account at oarc.rutgers.edu/access](https://oarc.rutgers.edu/access)

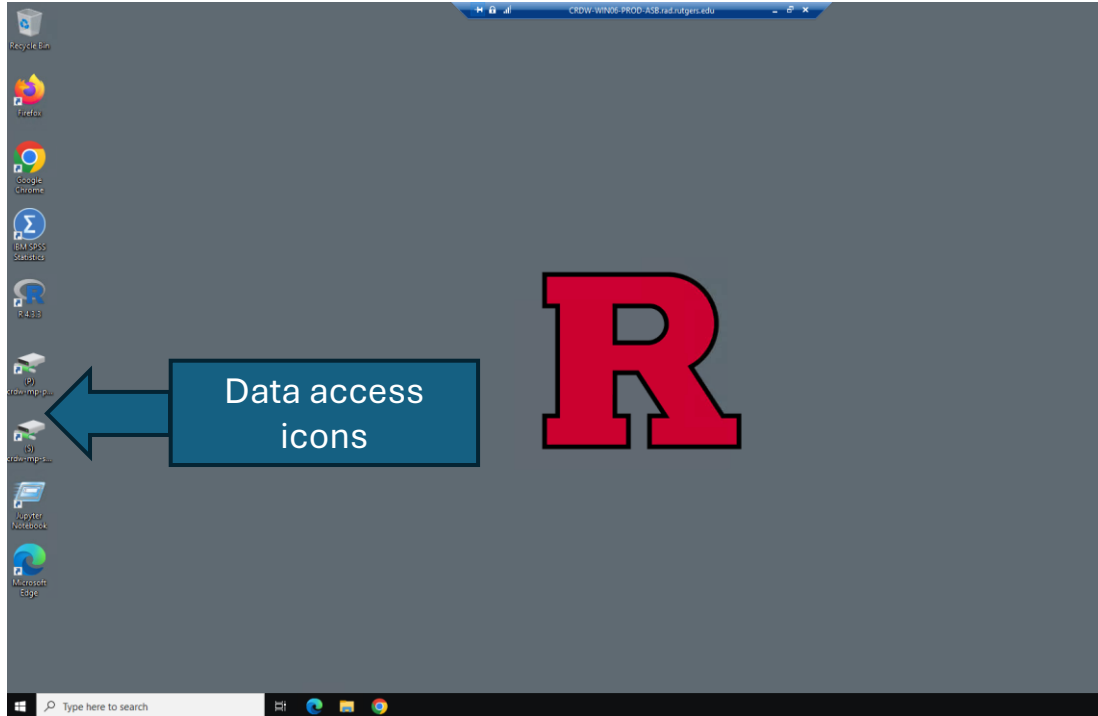
Office of Advanced Research Computing (OARC)

Data Request - Steps

- Consultation with the CRDW Analytics team
- Data request on the CRDW website
- IRB approval
- Data Governance Council (DGC) approval
- Data search and extraction
- Data Transfer
- Virtual Machine (VM) installation and data transfer
- Data Transfer to other resources (Amarel)
- **Data analytics on VMs**
- Fees

Virtual Machine Data Analytics

Windows VM



Preinstalled software stack

- Firefox browser (latest available)
- Chrome browser (latest available)
- Jupyter notebook (latest available)
- Miniconda -> miniforge
- 7zip archive
- Xpdf
- SQL Server Management Studio (SSMS)
- RStudio Desktop 2022.xx.x
- OpenJDK 17.0.4.1 LTS
- Microsoft Office: Word, Excel, PowerPoint, Access (v. 2019 or later)
- Python (latest available)
- R-4.2.1 (or later version)
- SPSS

More programs and modules can be added on demand.

Extracted data in Tabular (Table like structure - Excel) or CSV format or Database

Data Request - Steps

- Consultation with the CRDW Analytics team
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- **Fees**

CRDW Cost Estimation for Data Requests

The minimal project for **de-identified dataset** will cost about **\$500** (up to 10 hours of data extraction and data transfer fee) – one time payment.

For **LDS dataset**, which will require a computational resource and storage, the cost will be \$450 for data extraction (up to 10 hours) and \$400 for Virtual Machine for 1 year, thus totaling to about **\$850** for the first year and then \$400 for the following years just for VM/storage.

Accommodations for Trainees and Junior Faculty will be supported

Fee Schedule:

<https://it.rutgers.edu/clinical-and-research-data-warehouse/fee-schedule/>

Grant Application Help

- **Letter of Support (LOS)**
- **CRDW description for grant applications**
- **Server locations and security description**

Web: crdw.rutgers.edu

Contact email: crdw_requests@oarc.rutgers.edu

- Questions?

