Accelerated Cancer Research

Uncovering Hidden Lifesaving Knowledge

"3D digital cancer pathology creates a terabyte of data per patient. This challenged us as never before to scale our analysis pipelines, be they for detecting millions of cancer cells within images, warehousing these cells' many features, or training deep neural networks to interpret those features and predict patient outcome. Oracle for Research rapidly conveyed the Oracle Cloud Infrastructure and know-how to address these unyielding computational needs."

— Dan Ruderman, PhD, Lawrence J. Ellison Institute for Transformative Medicine of USC

ORACLE for Research

Lawrence J. Ellison Institute for Transformative Medicine of USC

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Democratizing Cancer Diagnosis, Treatment and Patient Care

How do you make precision cancer care available to the world?

For patients with hormone-receptor positive breast cancer, a course of treatment that includes the drug Tamoxifen can be lifesaving. But not all breast cancers are hormone-receptor positive; a pathologist must examine tumor tissue samples to determine the type of breast cancer a patient has. Within tissue samples are clues to precise, individualized, more accurate diagnosis and treatment, and it is the job of a pathologist to know where and how to look to spot these clues. Unfortunately, this type of testing is expensive and resource intensive, and for geographic, socioeconomic, and other reasons, sometimes including an unfavorable pathologist-to-patient ratio, many patients around the world cannot benefit from it.

Dan Ruderman, Ph.D., and his team of researchers at The Lawrence J. Ellison Institute for Transformative Medicine of the University of Southern California wondered: what if breast cancer diagnosis weren't limited by the proximity and availability of a pathologist and her discerning eye, carefully analyzing tissue samples? What if her work could be made more efficient by knowing more quickly where to look within the tissue samples? What if tumor tissue samples contain hidden clues her eye can't see? Could machine learning, driving an algorithm's artificial neurons modeled after a human brain, more efficiently and accurately identify and categorize cancer than traditional pathology methods? If the answer is yes, this new approach could democratize access to this type of life-saving testing, enabling medical practitioners to reimagine cancer care and save lives.

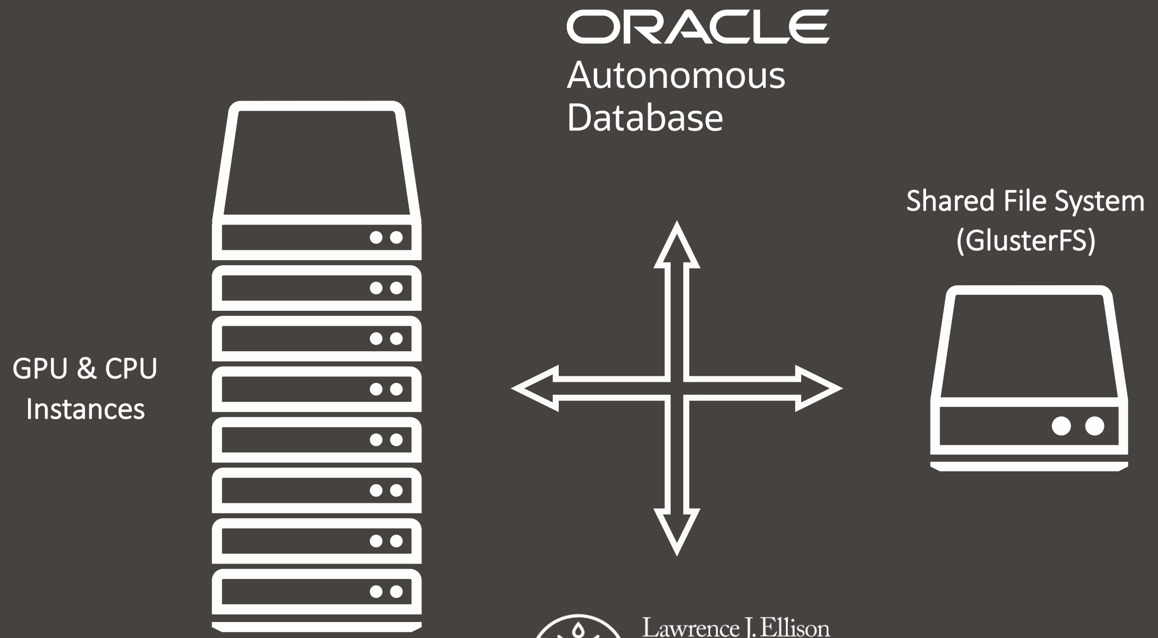
Accelerated Cancer Research

Reimagining Cancer Pathology with AI and Machine Learning

- The Lawrence J. Ellison Institute for Transformative Medicine of USC (The Ellison Institute) researchers want to redefine cancer care using artificial intelligence and deep machine learning to more precisely and accurately diagnose and treat cancer for patients worldwide.
- They envision an expansion of scientific experimentation into computational labs, and combining traditional "wet lab" technologies with the power of artificial intelligence and machine learning – key in their cost-effective "tissue fingerprints" approach to precise cancer classification.
- The Ellison Institute needed the power of enterprise computing to process the very large data sets that are integral to training their deep neural network designed to identify and classify breast cancer subtypes. The Ellison Institute turned to Oracle's high performance cloud infrastructure to develop a novel computational approach to process large numbers of scanned slide images in a way that the team's previous on-premise computers could not. This enabled the research team to evolve a computer "eye" that is optimized to look at and precisely classify patterns in cancer tumors, potentially increasing the efficiency of pathologists, reducing the costs of cancer diagnosis, and improving patient outcomes.

OCI ARCHITECTURE

ORACLE Cloud



Lawrence J. Ellison Institute for Transformative Medicine of USC

OCI Services Used

- Compute Virtual Machine (VM)
- Compute Bare Metal (BM)
- Compute GPU Machine (GPU)
- Oracle Kubernetes Engine (OKE)
- File Storage Service (FSS)
- Block Volume (BV)
- Autonomous Data Warehouse (ADW)
- Networking (VCN, VPN, IG, LPG, NAT)

Accelerated Cancer Research

Reimagining Cancer Pathology with AI and Machine Learning

Digital Pathology Preprocessing

Network

- VCN:1
- Subnets: 2
- RT: 2
- SL: 2
- NAT Gateway: 1
- Internet Gateway: 1
- LPG: 1

Services

- OKE

Compute

- BM.Standard2.52: 3 (GlusterFS Servers)
  - 2 VNICs for each server
- VM.Standard2.2: 1 (bastion host)
- VM.Standard2.24: 7 (6 OKE Worker Nodes, 1 GlusterFS Client)

Storage

- Block Volume Total size: 19200 GB
  - 3 Gluster Servers X 8 block volumes X 800 GB (block volume size)

Market Place

- Oracle Linux 7.7 UEK Image for GlusterFS file system

Digital Pathology AI/ML/Modeling

Network

- VCN:1
- Subnets: 2
- Internet Gateway: 1

Compute

- GPU3.1: 10 (new)
- Standard2.1: 1
- GPU2.2: 10 (old)

Storage

- FSS: As needed

ADW

- OCPU: 8
- Storage: 10TB

Digital Pathology AI/ML/Modeling

Compute

- Standard2.4: 1
- Windows OS

Storage

- Block Volume: 64G