COVID-19 economic, academic, social, physical, and mental health impacts on University communities

Prof. Les Sztandera, PhD
Les.Sztandera@Jefferson.edu
Les Sztandera, PhD is Tenured Full Professor of Computer Science at Thomas Jefferson University in Philadelphia, PA where he teaches Data Mining and Predictive Analytics at the undergraduate level (Bachelor’s), as well as Competitive Technical Intelligence, New Product Development, and Machine Learning at the postgraduate levels (Master’s and Doctoral). Academic Year 2022-23 is Prof. Sztandera’s 30th consecutive year at professorial appointment at Jefferson.

Prof. Sztandera is a Fellow of IARIA.

Jefferson is a leader in higher education with its distinctive, active, collaborative, real-world Nexus Learning teaching approach, as well as world class research.
Thomas Jefferson University

10 Colleges + 4 Schools
- College of Architecture and the Built Environment
- College of Health Professions
- College of Humanities and Sciences
- College of Life Sciences – Graduate School of Biomedical Sciences
- College of Nursing
- College of Pharmacy
- College of Population Health
- College of Rehabilitation Sciences
- Kanbar College of Design, Engineering and Commerce – School of Business – School of Design and Engineering
- Sidney Kimmel Medical College
- School of Continuing and Professional Studies

200+ Graduate & undergraduate programs

69,500 Alumni
8,200+ Students (full/part-time)

over $172 million in sponsored research awards

17 NCAA Division II Teams

1,000+ patents for new drugs, software innovations, medical devices and diagnostic tools

Nationally ranked in a variety of areas including fashion, occupational therapy and nursing
Academic Areas of Interest

Campuses
- Center City
- East Falls
- Dixon
- Bucks County
- Voorhees
- Jefferson Institute for Bioprocessing

International Study Locations & Research Centers
- Africa
- India
- All-Island Ireland
- Israel
- Italy
- Japan
- Latin America
Jefferson Health

18 Hospitals

- Einstein Medical Center Elkins Park*
- Einstein Medical Center Montgomery
- Einstein Medical Center Philadelphia*
- Jefferson Abington Hospital*
- Jefferson Bucks Hospital
- Jefferson Cherry Hill Hospital*
- Jefferson Frankford Hospital
- Jefferson Hospital for Neuroscience*
  - Vickie and Jack Farber Institute for Neuroscience
- Jefferson Lansdale Hospital**
- Jefferson Methodist Hospital*
- Jefferson Stratford Hospital*
- Jefferson Torresdale Hospital
- Jefferson Washington Township Hospital*
- Magee Rehabilitation Hospital
- MossRehab*
- Physicians Care Surgical Hospital
- Rothman Orthopaedic Specialty Hospital
- Thomas Jefferson University Hospital*
  - Sidney Kimmel Cancer Center (NCI-designated)

* Magnet® designation from the American Nurses Credentialing Center for nursing excellence
** Pathway to Excellence® designation from the American Nurses Credentialing Center for sustaining a positive practice environment

3,500 physicians/practitioners (employed)

9,600 nurses (full/part-time)

50+ outpatient and urgent care locations

6.2 million outpatient visits
Digital Collaboration Tools utilized under COVID-19 pandemic

Five companies utilizing sustainable computer architectures captured over 70 billion US dollars already in the 2019: IBM, Google, Microsoft Azure, Amazon, and Alibaba and they have thrived under the COVID-19 pandemic.
Digital collaboration tools utilized under COVID-19 pandemic by Colleges and Universities

• All on-line teaching activities, video meetings and conferences, as well as digital collaboration tools utilized under COVID-19 pandemic by colleges and businesses: open source Moodle and Workspace, as well as Canvas, Zoom, WebEx, Slack, Microsoft Teams, Blackboard, Google Classroom, Any Meeting, Hangouts Meet, and Monday, run on cloud computer architectures.

• The most often utilized digital platforms: Zoom and Blackboard run on Amazon Web Services.

• Hewlett-Packard and Adobe depend on Microsoft cloud platform, while WebEx Cisco collaborating center utilizes Tata’s cloud computing architecture.
On-line learning shift

• For Universities and schools, the biggest challenge in the on-line transition has been to acknowledge that providing a digital platform for teaching the class that would be otherwise taught in-person, is simply not enough. Additionally, studio and laboratory teaching provided additional extraordinary obstacles. On-line learning necessitates a complete makeover of the teaching and delivery modes on one hand, and the use of sustainable computer architectures, on the other hand, to satisfy curricular activities as well as students learning objectives.
Learning mechanisms for in-person classroom teaching

• From the students’ learning perspective, there is the need to transfer to students’ knowledge acquisition relevant to a particular discipline.

• Then comes the transformation of that knowledge into professional competence by solving case studies.

• Third, students need to exchange ideas and to participate in discussions to satisfy class learning outcomes.
Learning mechanisms delivered through on-line education

- In an on-line education, learning mechanisms cannot be delivered through a single digital platform. They have to be taught through different tailored delivery modes.

- Knowledge acquisition and its transfer is realized through live, on-line sessions, using digital platforms such as Zoom, Microsoft Teams, WebEx, Slack, Google Hangouts.

- Exchanging ideas and participating in discussions is accomplished through semi-synchronous social platforms tools, accurately moderated by professors.
Distributed Computing vs Grid Computing

• **Distributed Computing** uses a centralized resource manager and all nodes cooperatively work together as a single unified resource or a system.

• **Grid Computing** utilizes a structure where each node has its own resource manager and the system does not act as a single unit.

• We will focus on **Grid Computing** structure to address COVID-19 imposed restrictions on both academic and health service deliveries.
Grid Computing

• Grid Computing leverages multiple computers, often geographically dispersed, yet interconnected by internet, that are synchronized to accomplish complex joint tasks.
• Some of the computers are unutilized, due to the location and time difference, thus contributing to the sustainable computer architecture. Grid computing is realized through software installed on every computer that utilizes data grid.
• The software manages the entire system and coordinates multiple tasks across the whole grid by assigning subtasks to each computer, so the computers could work simultaneously on their respective assignments. After the completion of subtasks, the outputs are collected and subsequently combined to address a larger-scale complex problem.
Virtualized Computing

- Virtualization is the process of designing and implementing a software-based, or virtual, representation of applications, servers, storage, and networks.

- A virtual computer architecture, coined Virtual Machine (VM), is a single software piece running an operating system and containing applications. Each virtual machine is completely independent and self-contained.

- Placing several virtual machines on a single computer enables several operating systems and applications to run on just one physical server, or host.
Although both are often used technologies during the COVID-19 pandemic, and both part of sustainable computer architecture, virtual and cloud computing are not transposable.

Virtual Computing is realized through software that makes computing environments unconstrained of the physical computer platform.

Cloud computing, on the other hand, is a service that delivers shared computing resources data and software on demand through the Internet.
Cloud Computing 2

• Cloud computing tools such as Oracle’s Zoom virtual meeting tool has enabled organizations to transition successfully, or at least less disruptively, to a remote workforce.

• At Thomas Jefferson University Jefferson Health, implementation began months prior to the pandemic to equip its facilities with teleconferencing equipment run on Zoom platform.

• The need for an enterprise teleconferencing infrastructure became apparent as the Philadelphia health system acquired other locations, and offices and clinical treatment areas spanned the metropolitan area, and neighboring states of New Jersey and Delaware.
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Telehealth at Thomas Jefferson University

• The implementation of the virtual meeting technology added the flexibility for faculty and staff teams to meet virtually in real time, while being able to work from their traditional office areas.

• The execution of the tele-meeting workflow was largely on-campus, with technical support services nearby and resourced ready to assist in the facilitation of the on-line meetings.

• As the pandemic swept across North America, Jefferson’s workforce was able to continue schedule and hold its meetings using Zoom’s cloud infrastructure with minimal or no additional adaptation required.
National Center for Telehealth Education and Research (NCTER)

- A formal extension of the infrastructure was the establishment of the National Center for Telehealth Education and Research (NCTER) at Thomas Jefferson University.

- The center has led efficient practices for telehealth implementation through breakthrough research, teaching, and training to deliver health services through the digital mode.
Teaching and Training at NCTER

• Examples of teaching and training avenues include:

  • 1. Certificates in Telehealth and Digital Health Innovation, as well as in Telehealth Facilitator Program;

  • 2. Coursework in Telehealth and Connected Care, and in Conducting an Effective Physical Exam.

  • 3. In addition, Jefferson’s flagship Fellowship Program in Telehealth Leadership was established.
Research at NCTER

• Research in digital readiness was initiated and supported to ensure digital health equity across vulnerable communities.

• In addition, as a result of the implementation of a sustainable computer architecture, a computer model of uncertainty and care seeking was developed based on the primary unmet needs after the hospital emergency department visits.
Research at NCTER 2

- **Jefferson Uncertainty Scale** to measure patient uncertainty during an acute care visit, and the **Uncertainty Communication Checklist** to improve communication with patients who are discharged with ongoing uncertainty were developed.

- Subsequent research projects have focused on **crafting health care interventions** to guide patients in terms of handling their uncertainty, improving their experience, and most importantly decreasing healthcare costs through significantly reducing the need for non-routine care visits.
Research at NCTER 3

- Cloud computing architecture also allowed for a significant contribution to, and social impact into, nutrition aspects of patients’ wellbeing through research in healthy food choices to support chronic illnesses, and following recommendations on developing methods to coalesce nutrition-related services into routine scheduled care.

- It has also contributed to social impact of COVID-19 vaccination efforts through data analytics techniques to understand and address obstacles to vaccine confidence among minority and underserved populations in the Philadelphia metropolitan area.
Another research area that has been investigated was utilizing cloud computing in applying qualitative and quantitative research approaches to bring forth patient perspectives with regard to unmet needs in terms of looking for non-routine care, with an ultimate goal of informing decisions of a health care provision system more responsive to personalized patient medicine interventions.
Research at NCTER 5

• Thomas Jefferson University graduate students in Public Health programs formed Digital Outreach Taskforce (DOT) to serve patients through an initial set up and following engagement in telehealth options.

• It was first assembled in September 2020 to provide personalized health interventions to patients through setting up computer tablets as well as remote digital monitoring devices that had been distributed as part of government secured during the COVID-19 pandemic.
Conclusions

• As a global pandemic has strained global resources in education, grid, virtualized, and cloud computing have been accessible ways where merely a computer tablet or a wearable digital device could provide meaningful support to the teaching, research, and medical communities.

• Sustainable computer architectures, such as shared computing, might help accelerate treatments for novel viral pandemics such as COVID-19.

• At the same time combating electronic waste, energy consumption, and carbon emissions requires enterprises and entities to focus on creating sustainable computer architectures as a critical part of Corporate Social Responsibility.