Sandra C. Karcher, PhD, PE

As an accomplished IT professional, I have expertise across various domains, including data and database management, data modeling, software design and development, statistical analysis, geospatial modeling, teaching, and report preparation. My dedication to remaining current with the latest technologies has enabled me to collaborate on successful projects over the course of decades. Areas of specific interest include crafting algorithms and scripts for data extraction, transformation, cleansing, analysis, aggregation, and visualization, particularly within the fields of chemistry, biology, and biomedical informatics.

Throughout my career, I have sought opportunities to contribute to projects that create value and drive progress. Committed to continuous growth, I am drawn to working with dynamic teams that foster collaboration and inspire creativity while striving to make a positive difference.

Visit my web page at **sandra444.github.io** to learn more about me.

Skills

- **Cloud Computing**: AWS Cognito, AWS Command Line Interface (CLI), AWS EC2, AWS Elastic Beanstalk, AWS RDS, AWS S3
- **Collaboration**: Confluence, Jira, Microsoft SharePoint, Microsoft Teams, Slack, Webex, Zoom
- **Database**: Microsoft Access, MySQL, PostgreSQL
- **Database Tools**: DbVisualizer, MySQL Workbench, Tableau, dBeaver, pgAdmin
- **Development Tools**: Atom, Jupyter Notebook, Notepad++, PyCharm, Rstudio, Visual Studio Code
- **Genomics**: Cytoscape, Ensembl BioMart, FDA Adverse Event Reporting System (FAERS), Gene Expression Omnibus (GEO), Genome-wide Association Studies (GWAS) Catalog, Human Genome Organization (HUGO), Kyoto Encyclopedia of Genes and Genomes (KEGG), National Center for Biotechnology Information (NCBI), Rat Genome Database (RGD)
- **Geographic**: ArcGIS
- **Interoperability**: Fast Health Interoperability Resources (FHIR), Protege, Web Ontology Language (OWL)
- **Languages/Frameworks**: C++, CSS, D3, Django, HTML, Java, JavaScript, Python, R, jQuery
- **Office Suite**: LibreOffice, Microsoft Office
- **Operating Systems**: Linux, Mac, Windows
- **Presentation Tools**: Adobe Premiere Elements, Inkscape, Lucidchart, PowerPoint, iMovie, iPhoto, Adobe Photoshop
- **Reference Management**: Endnote, Sciwheel
- **Software as a Service (SaaS)**: Terraform
- **Version Control**: Bitbucket, Git, GitHub

Education

- **PhD** Civil and Environmental Engineering, Carnegie Mellon University
- **MS** Civil and Environmental Engineering, Carnegie Mellon University
- **BS** Civil and Environmental Engineering, University of Maryland

Certifications & Licenses

- Professional Scrum Master I - Scrum.org
- Pennsylvania Department of State, Professional Engineer License PE082453
- Biomedical Informatics Certificate (April 2022), University of Pittsburgh

Job History

2023 to 2024 – Senior Software Engineer, Numa Biosciences (formerly Nortis)

- Designed and developed a tool that enables uploading and downloading of data and metadata into and out of EveAnalytics (formerly known as the Microphysiology Systems Database (MPS-Db) and the BioSystics-AP) using the same data format.
- Led the development team through the process of transitioning biosystics-ap.com (an open data repository) to eveanalytics.com (a subscription-based data management and analytics platform).
- Served as the Scrum Master (using the Agile methodology) throughout the process of transitioning biosystics-ap.com to eveanalytics.com.

2016 to 2023 - Staff System/Programmer, University of Pittsburgh Drug Discovery Institute

- Deployed Django web application in AWS using Elastic Beanstalk.
- Enabled the integration of transcriptomic data into the MPS-Db.
- Designed and developed a statistical tool to calibrate raw plate reader assay data and incorporated it into the MPS-Db.
- Developed algorithms to extract, transform, cleanse, slice, analyze, aggregate, and visualize data to support downstream analysis, modeling, and visualization (primarily using Python, VBA and SQL).
- Prepared training materials for internal team members and external collaborators.
- Provided training and technical support to users of the MPS-Db.
- Designed an effective data governance framework for uploading data into the MPS-Db (e.g., defining the parameters for data acquisition, import, and usage; selecting appropriate controlled vocabulary to enable data from disparate sources to be aggregated together; creating processes for identifying and resolving data quality issues).

2014 to 2016 - Postdoctoral Project Engineer, Carnegie Mellon University

- Worked in collaboration with the Center for the Environmental Implications of NanoTechnology, nanoHUB, and the Nanomaterial-Biological Interactions Knowledgebase to develop analytical and visualization informatics tools to be used on experimental data exploring the fate and associated risk of introducing nanomaterials into the environment (https://nanohub.org/resources/23991).
- Designed and built a relational database to aggregate, store, and maintain data collected as part of experimental studies performed using nanomaterials.

2013 to 2014 - Adjunct Professor, Carnegie Mellon University

- Taught Databases & Data Systems for Environmental Modeling, a hands-on class focused on finding, formatting and visualizing data frequently used in environmental modeling.

2009 to 2012 - Postdoctoral Research Associate, Carnegie Mellon University

- Collaborated with colleagues at the EPA to assess the challenges associated with modeling water systems from the watershed through the drinking water treatment process.
- Used the Soil and Water Assessment Tool (SWAT), an ArcGIS modeling tool, to quantify changes in nutrient loading resulting from changes in watershed management practices.

2006 to 2008 - Adjunct Professor, Geneva College

- Taught Solid & Hazardous Waste Management and Water & Wastewater Treatment. The solid waste class focused on the collection, transformation, and disposal of solid and hazardous waste. The water class included a weekly lab and focused on technologies used in testing and treating water.

2000 to 2005 - Graduate Student, Carnegie Mellon University (Master's & PhD)

- Designed and developed a statistical modeling tool to determine the likely pathways of dechlorination of polychlorinated biphenyls in river sediments. Tool implementation required extensive use and integration of Microsoft Access and Excel using Visual Basic for Applications (VBA) and SQL.
- Served as teaching assistant for the freshman level introduction to civil and environmental engineering course and for the graduate level probability and statistics course.

1993 to 2002 – President & Consultant, Data Systems DCM

- Compiled and standardized U.S Air Force environmental sampling data from multiple sources provided in a variety of formats.
- Developed and programmed tools to search for patterns, trends, and anomalies in data; to flag potentially erroneous data; and to cleanse the database (primarily using VBA and SQL).

Recent Publications

- Schurdak M, Vernetti L, Bergenthal L, Wolter QK, Shun TY, Karcher S, Taylor DL, Gough A, Applications of the microphysiology systems database for experimental ADME-Tox and disease models. Lab Chip. 2020 Apr 14; 20(8):1472-1492.
- Dilán-Pantojas, IO, Boonchalermvichien, T, Taneja, SB, Li, X, Chapin, MR, Karcher, S, Boyce, RD, Broadening the capture of natural products mentioned in FAERS using fuzzy string-matching and a Siamese neural network. Sci Rep 14, 1272 (2024).
- Karcher, S.C., Harper, B.J., Harper, S.L., Hendren, C.O., Wiesner, M.R., Lowry, G.V., Visualization Tool for Correlating Nanomaterial Properties and Biological Responses in Zebrafish. Environmental Science: Nano 3: 1280-1292 (2016).
- Marchese Robinson RL, Lynch I, Peijnenburg W, Rumble J, Klaessig F, Marquardt C, Rauscher H, Puzyn T, Purian R, Åberg C, Karcher S, Vriens H, Hoet P, Hoover MD, Hendren CO, Harper SL. How should the completeness and quality of curated nanomaterial data be evaluated? Nanoscale. 2016 May 21; 8(19):9919-43.