CHRISTOPHER J. LLOP
Vice President

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Mr. Llop specializes in leading technical and data science teams in litigation and non-litigation settings. His litigation work spans intellectual property (IP), antitrust, cybersecurity, health care, energy, and commercial disputes, and his experience includes enterprise cloud platforms, mobile applications, embedded devices, and AI systems. Mr. Llop has supported experts through forensic review of source code and logs, data flows, live testing and simulation, and technical reconstruction to clarify how algorithms and data were used. He has led the analysis of large, complex, and scraped datasets and has conducted detailed qualitative investigations into technological issues. He also supports damages analyses through modeling and by establishing connections between technical evidence and economic conclusions. Mr. Llop's case work includes disputes involving allegations of algorithmic collusion, IP theft, the training and use of AI models, mobile app store security, and how software was developed or configured. He has also served as an expert and provided testimony in a matter before the National Advertising Division.

In addition to his litigation work, Mr. Llop has extensive modeling experience in health care and energy. He has conducted studies on treatment outcomes and adverse event rates, built mobile and wearable applications to collect real-world data from health care study participants, and used a variety of tools to model the potential impact of proposed changes to the structure of energy and capacity markets. He plays a leadership role in the firm's internal data science team and contributes to its strategic guidance on emerging technologies, including AI. Mr. Llop has also volunteered on analytics projects in Haiti and taught Python Fundamentals for Data Science as a lecturer at the University of California, Berkeley.

EDUCATION

2016	M.I.D.S., information and data science, UC Berkeley School of Information
2010	B.S., electrical engineering, State University of New York at Buffalo

PROFESSIONAL EXPERIENCE

2011–Present	Analysis Group, Inc. *Vice President (2022–Present)* *Manager (2019–2021)* *Associate (2016–2018)* *Analyst/Senior Analyst (2011–2016)*
2016–2023	UC Berkeley School of Information *Lecturer*

SELECTED CONSULTING EXPERIENCE

Software, Technology, and Cybersecurity

- Provided detailed technology and source code analysis of search engine and recommendation system technologies for a litigation matter, such as those involved in crawling, extracting, mining, searching, and recommending content gathered from users and the web.
- Led a team in analyzing a source code system accused of providing a means of algorithmic collusion to platform contributors. Conducted a detailed analysis of code logic and data providence, including analysis of user-specific log and configuration details.
- Conducted detailed testing on mobile phone wireless connectivity under various carrier-imposed throttling conditions. Provided testimony to the National Advertising Division regarding findings.
- Analyzed the training methodology for a generative AI system to support arguments related to the fair use of data used in training inputs.
- Led an analysis of operational constraints when divesting part of a software platform in connection with legislation requiring TikTok to divest its US assets.
- Led a team in technical analyses regarding an internet of things-based data collection (logging) system deployed on hundreds of thousands of devices. Designed experiments related to the data transfers of the system and conducted copyright-related analyses of source code and executable files.
- Led multiple teams focused on cybersecurity issues involving app stores, including aspects on malware detection, the safety of various app distribution channels, and defense-in-depth approaches to maintaining user security and privacy.
- Led a team in analyzing allegedly misappropriated trade secrets related to fraud detection in barcode and QR code–based tracking systems.
- Reverse-engineered a computer "cleaning" tool to opine on the mechanisms by which it solved common PC issues, protected privacy, and detected malware.
- Provided detailed support for a patent litigation matter regarding cloud data storage, including analysis of infringement contentions, creation of non-infringement arguments, and technical guidance related to claim construction. Led team studying and providing evidence from over 70,000 code files.
- Analyzed the source code for millions of files across programming languages for a multibillion-dollar tax litigation. Measured the similarity between pairs of files to understand how developers modified the source code over time.
- Provided an analysis of SAP and enterprise resource planning (ERP) systems in connection with a dispute involving SAP HANA, SAP Cloud Integration, and SAP Data Services.
- Performed a detailed review of source code in a dispute involving networking protocol. Identified the presence and use of specific third-party codes, assisted in identifying code versions active during product compilation, and developed scripts to flag lines of code for further review.
- Analyzed technology logs from a malware attack causing millions of dollars to be transferred to hackers around the world. Supported an affiliated expert in examining available anomaly detection methods and whether the defendant's fraud detection system met commercial industry standards.
- Led litigation analysis of the source code for a variety of systems across projects, including those alleged to be automated telephone dialing systems, those alleged to be AI (without actually being so), and firmware running on fast-food kitchen equipment.

- Analyzed the source code for a geographic information system, identifying evidence that the opposing party decompiled and then stole the client's source code and trade secrets verbatim.
- Led an organizational review of Security and Stability Advisory Committee (SSAC) for the Internet Corporation for Assigned Names and Numbers (ICANN).
- Performed research and analysis for technology companies such as Facebook and Google regarding the regulation of and law around machine learning, artificial intelligence, and data privacy.
- Managed a team developing detailed case studies of competitors in the modem chip industry, and applied an industrial organization economics framework to understand the drivers of company success.
- Led forensic review of laptops and mobile devices to locate indicia related to missing backup files.
- Assisted in the development of cross-examination strategy related to the digital forensics of when an email was saved and whether it was viewed.
- Assisted in the development of an expert report related to matters of responsible disclosure in the face of cybersecurity vulnerability discovery.
- Led image forensic analyses to identify duplicate images among production documents.
- Developed natural language processing techniques to quantify the similarity between documents in multiple copyright litigations.
- Led a team in analysis of data in support of multiple class certification expert reports, showing variation in class based on indicia of consent in the underlying databases.
- Regularly managed the preparation of "code rooms" for litigation expert work, ensuring that files and technology were properly in place for analyses.

Energy and Environment

- Led a team developing an application that leverages social media data to track the spread of a wildfire over time.
- Worked with ISO New England (ISO-NE) to develop an analysis of the impact of incorporating carbon pricing into the dispatch of electric power plants, simulating wholesale market outcomes, prices, and customer payments. Used production cost and capacity market modeling techniques.
- Conducted in-depth analysis of financial transmission rights (FTR) trading strategies for a litigation matter involving the alleged theft of trading strategies. Analyzed the use of custom and off-the-shelf energy flow modeling tools as part of trading strategy.
- Worked with ISO-NE to develop a bespoke production cost model that used linear programming to evaluate the impact of proposed Energy Security Improvement changes to the ISO-NE energy markets, including the evaluation of new market products co-optimized with existing products.
- Worked with the New York Independent System Operator (NYISO) to conduct a study of the parameters to use in NYISO's Installed Capacity Demand Curves for four capability years. Updated peaking plant model and extended modeling scenarios considered to include energy storage (batteries) as a peaking plant option.
- Worked with ISO-NE to evaluate the economic outcomes for the years 2025 and 2030 under five different scenarios corresponding to different assumptions about changes in the resources within the ISO-NE system, including modeling market rule changes to capacity markets.
- Modeled changes in power plant generation and emissions as a result of the Regional Greenhouse Gas Initiative (RGGI) program.

- Worked with NYISO to complete a reset of the demand curve for the NYISO capacity markets. Developed an in-depth model of peaking plant operations and financial performance across localities over a three-year time horizon for each NYISO locality. Worked with NYISO stakeholders to incorporate feedback on modeling approach.
- Conducted a cost-benefit analysis of different scenarios for meeting New England's peak winter electricity needs, testing the cost effectiveness of building a new natural gas pipeline for electricity generation compared with other solutions.
- Conducted analyses of the competitiveness of specific utility rate structures that included both energy and peak demand components for an antitrust litigation matter. Studied the impact of rate structures on rooftop solar economic benefits. Reverse-engineered the client's calculations and codes used in ratemaking so that they could be defended in an expert report.
- Conducted detailed PROMOD modeling of the economic impact of a proposed transmission project, examining the impact on locational marginal prices, production costs, air emissions, and costs to consumers under a variety of scenarios.
- Assisted the ISO-NE Internal Market Monitor in modeling going-forward costs, which was the basis for resource delist offers into ISO-NE's forward capacity market.
- Analyzed potential market and cost impacts of introducing a forward capacity market in NYISO, including modeling of clearing prices, investment incentives, and implementation considerations.
- Developed an economic impact study of a proposed crude-by-rail terminal, including the impact of various types of rail crossings.
- Analyzed how the use of historical, hybrid, or future test years in utility rate cases affects electric utilities' ability to earn authorized returns on equity and maintain credit ratings.
- Conducted detailed economic retirement risk assessment of New York power plants for NYISO. Supported internal report evaluating financial viability of generation units under a range of market and regulatory scenarios.
- Conducted research into the potential economic impact of more stringent National Ambient Air Quality Standards (NAAQS) for ozone.
- Conducted economic feasibility study related to proposal to install prototype energy storage technology.
- Conducted levelized cost of electricity analysis related to proposed combined cycle plant expansion, demonstrating superior ratepayer value and policy alignment of the client's bid compared to competing combustion turbine proposals.
- Conducted extensive modeling and impact assessment of ISO-NE's proposed "pay for performance" mechanism, which adjusted capacity payments based on real-time performance during reserve scarcity conditions. Analyzed effects on prices, resource mix, and reliability outcomes, and compared ISO-NE's proposal to NEPOOL's alternative.
- Worked with an electric distribution participant to examine and provide recommendations regarding overall ratemaking models to be advanced at state public utilities commissions.
- Provided an assessment of policies considered by the Commonwealth of Massachusetts aimed at achieving cost-effective energy efficiency in commercial and residential buildings.
- Provided an analysis of carbon markets and rulemaking across jurisdictions.
- Conducted analyses related to contract for natural gas and shares sold by various participants within the Austral Basin.

- Conducted modeling of the value provided by a pumped storage project.
- Analyzed 43,000 pages of deposition transcripts to develop analyses related to the safety culture and policies of an international oil and gas company after an environmental disaster.

Health Care and Finance

- Led a team developing an international data collection pipeline for patient survey information and objective measurements related to disease progression.
- Led the development of a wearable device mobile app (iPhone and Apple Watch) for a pilot study investigating the capability of using digital health as a tool to assist in clinical trials. Oversaw development of the front and back end, app testing, and real-time data collection processes.
- Led a team developing and deploying a physician-facing tool to show the results of a machine learning model predicting antibiotic resistance for a certain disease.
- Designed data intake systems for a large health care case involving tens of terabytes of undocumented data and non-data files. Led the process of organizing and classifying files and preparing them for rigorous data analysis.
- Designed and implemented statistical analyses measuring health care claims and electronic medical records (EMRs) of antibiotic impacts on patients with community-acquired pneumonia.
- Developed analyses modeling alleged overcharges to bank clients in a litigation matter involving foreign exchange trades of an international custodian bank. Streamlined codes for multi-person cleaning of a large amount of disorganized data.

ARTICLES AND PUBLICATIONS

"Digital health technologies and machine learning augment patient reported outcomes to remotely characterise rheumatoid arthritis," with Andrew P. Creagh, Valentin Hamy, Hang Yuan, Gert Mertes, Ryan Tomlinson, Wen-Hung Chen, Rachel Williams, Christopher Yee, Mei Sheng Duh, Aiden Doherty, Luis Garcia-Gancedo, and David A Clifton, *NPJ Digital Medicine* (February 2024)

"Patient-centric assessment of rheumatoid arthritis using a smartwatch and bespoke mobile app in a clinical setting," with Valentin Hamy, Christopher W. Yee, Luis Garcia-Gancedo, Aoife Maxwell, Wen Hung Chen, Ryan Tomlinson, Priyanka Bobbili, Julien Bendelac, Jessica Landry, Maral DerSarkissian, Mihran Yenikomshian, Elinor A. Mody, Mei Sheng Duh, and Rachel Williams, *Scientific Reports* (October 2023)

Pathways Study: Evaluation of Pathways to a Future Grid, with Todd Schatzki, Phillip Ross, Jenny Shen, Daniel Stuart, Tyler Farrell, Conor McManamy, Luke Daniels, and Shaina Ma, prepared for ISO New England (ISO NE) (April 2022)

Independent Consultant Study to Establish New York ICAP Demand Curve Parameters for the 2021/2022 through 2024/2025 Capability Years – Initial Draft Report, with Paul Hibbard, Todd Schatzki, Charles Wu, Matthew Lind, Kieran McInerney, and Stephanie Villarreal, prepared for the New York Independent System Operator (NYISO) (September 2020)

Energy Security Improvements Impact Assessment, with Todd Schatzki, Charles Wu, and Timothy Spittle, prepared for ISO NE (April 2020)

Independent Review of the ICANN Security and Stability Advisory Committee, with Shlomo Hershkop, Greg Rafert, and Steve Weber, prepared for the Internet Corporation for Assigned Names and Numbers (ICANN) (December 2018)

Capacity Market Impacts and Implications of Alternative Resource Expansion Scenarios: An Element of the ISO New England 2016 Economic Analysis, with Todd Schatzki, prepared for ISO NE (July 2017)

"Antibiotic treatment patterns, costs, and resource utilization among patients with community acquired pneumonia: a US cohort study," with Edward Tuttle, Glenn S. Tillotson, Kerry LaPlante, and Thomas M. File, Jr., *Hospital Practice* (February 2017)

Study to Establish New York Electricity Market ICAP Demand Curve Parameters, with Paul Hibbard, Todd Schatzki, Craig Aubuchon, and Ellery Berk, prepared for the NYISO (June 2016)

"Antibiotic Treatment Patterns and Outcomes Following Outpatient Treatment of Community-Acquired Bacterial Pneumonia: A US Cohort Study," with Sara Eapen and Edward Tuttle, *Open Forum Infectious Diseases* (December 2014)

COMMUNITY INVOLVEMENT

- GHESKIO Centers
- Public Service Economics