Gabriel Tomas Fierro
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RESEARCH INTERESTS

Data/metadata management, systems, Internet of Things, ontology design, database implementation, smart buildings/cities/grids

CURRENT POSITION

Colorado School of Mines   Golden, CO
Assistant Professor, Computer Science   *August 2021 - present*

National Renewable Energy Laboratory   Golden, CO
Joint Appointment   *July 2021 - present*

EDUCATION

Ph.D. in Computer Science   August 2015 - May 2021
University of California, Berkeley   *Berkeley, CA*

- **PhD Thesis**: Self-Adapting Software for Cyberphysical Systems
- **Advisor**: David E. Culler

M.S. in Computer Science   December 2018
University of California, Berkeley   *Berkeley, CA*

- **Masters Thesis**: Design of an Effective Ontology and Query Processor Enabling Portable Building Applications
- **Advisor**: David E. Culler

B.S. in Electrical Engineering and Computer Sciences   August 2009 - May 2013
University of California, Berkeley   *Berkeley, CA*

PRIOR PROFESSIONAL EXPERIENCE

University of California, Berkeley   Berkeley, CA
Graduate Student Researcher   *August 2015 - May 2021*

University of California, Berkeley   Berkeley, CA
Research Staff   *September 2014 - August 2015*

Coleman Fung Institute   Berkeley, CA
Lab Manager   *September 2012 - September 2014*

GRANTS AND PROJECTS

Cyber-Physical Semantic Data Fabric: Enabling Grid-Interactive Buildings by sharing data across the meter *(PI)*
2022 — NEXUS Seed Grant ($17,467)

Community-scale Electricity Retrofits to Increase Resiliency and Reduce Energy Insecurity and Carbon Emissions *(Co-PI)*
2022 — Sloan Foundation ($500,000)

CONFERENCE PUBLICATIONS

- **Gabe Fierro**, Saha, A., Shapinsky, T., Steen, M., and Eslinger, H. (2022b). Application-driven creation of building metadata models with semantic sufficiency. In *Proceedings of the 9th ACM International Conference on Systems for Energy-Efficient Buildings, Cities, and Transportation*, BuildSys '22, page 228–237, New York, NY, USA. Association for Computing Machinery

- **Gabe Fierro**, Prakash, A. K., Blum, D., Bender, J., Paulson, E., and Wetter, M. (2022a). Notes paper: Enabling building application development with simulated digital twins. In *Proceedings of the 9th ACM International Conference on Systems for Energy-Efficient Buildings, Cities, and Transportation*, BuildSys '22, page 250–253, New York, NY, USA. Association for Computing Machinery

- Sun, R., Duarte Roa, C., Raftery, P., and **Gabe Fierro** (2022). Enabling portable and reproducible long-term thermal comfort evaluation with brick schema and mortar testbed. *ASHRAE Conference*

- Pauwels, P. and Fierro, G. (2022). A reference architecture for data-driven smart buildings using brick and lbd ontologies. *CLIMA 2022 conference*

- Wetter, M., Hu, J., Prakash, A. K., Ehrlich, P., **Gabe Fierro**, Grahovac, M., Pritoni, M., Rivalin, L., and Robin, d. (2022). Modelica-json: Transforming energy models to digitize the control delivery process

- Bennani, I. L., Prakash, A. K., Zafiris, M., Paul, L., Roa, C. D., Raftery, P., Pritoni, M., and **Gabe Fierro** (2021). Query relaxation for portable brick-based applications. In *Proceedings of the 8th ACM International Conference on Systems for Energy-Efficient Buildings, Cities, and Transportation*, BuildSys '21, page 150–159, New York, NY, USA. Association for Computing Machinery

- Moffat, K., Pakshong, J., Chu, L., **Gabe Fierro**, Swartz, J., Baudette, M., and von Meier, A. (2021). Phasor based control with the distributed, extensible grid control platform. In *2021 IEEE Power Energy Society Innovative Smart Grid Technologies Conference (ISGT)*, pages 1–5

- **Gabe Fierro**, Prakash, A. K., Mosiman, C., Pritoni, M., Raftery, P., Wetter, M., and Culler, D. E. (2020d). Shepherding Metadata Through the Building Lifecycle. In *Proceedings of the 7th ACM International Conference on Systems for Energy-Efficient Buildings, Cities, and Transportation*, BuildSys '20, Virtual Event, Japan

  Acceptance Rate: 38 / 139 (27%)

- **Gabe Fierro**, Koh, J., Agarwal, Y., Gupta, R. K., and Culler, D. E. (2019b). Beyond a House of Sticks: Formalizing Metadata Tags with Brick. In *Proceedings of the 6th ACM International Conference on Systems for Energy-Efficient Buildings, Cities, and Transportation*, BuildSys '19, New York, NY, USA

  Acceptance Rate: 40 / 131 (31%)

- Andersen, M. P., Kumar, S., AbdelBaky, M., **Gabe Fierro**, Kolb, J., Kim, H.-S., Culler, D. E., and Popa, R. A. (2019). WAVE: A Decentralized Authorization Framework with Transitive Delegation. In *28th USENIX Security Symposium (USENIX Security 19)*, Santa Clara, CA

  Acceptance Rate: 113 / 697 (16%)

- **Gabe Fierro**, Pritoni, M., AbdelBaky, M., Raftery, P., Peffer, T., Thomson, G., and Culler, D. E. (2018). Mortar: An Open Testbed for Portable Building Analytics. In *Proceedings of the 5th Conference on Systems for Built Environments*, BuildSys '18, Shenzen, China (**Best Presentation Award**)

  In Top 5 papers of conference   Acceptance Rate: 23 / 62 (37%)

- **Gabe Fierro** and Culler, D. (2017). HodDB: Design and Analysis of a Query Processor for Brick. *Proceedings of The 4th International Conference on Systems for Energy-Efficient Built Environments (BuildSys '17)*

  Acceptance Rate: 30 / 96 (31%)

- Balaji, B., Bhattacharya, A., **Gabe Fierro**, Gao, J., Gluck, J., Hong, D., Johansen, A., Koh, J., Ploennigs, J., Agarwal, Y., Bergés, M., Culler, D., Gupta, R. K., Kjærgaard, M. B., Srivastava, M., and Whitehouse, K. (2016a). Brick: Towards a unified metadata schema for buildings. In *Proceedings of the 3rd ACM International Conference on Systems for Energy-Efficient Built Environments*. ACM (**Audience Choice Award - Best Paper Finalist**)

  Acceptance Rate: 48 / 98 (49%)

- Andersen, M. P., **Gabe Fierro**, and Culler, D. E. (2016). System Design for a Synergistic, Low Power Mote/BLE Embedded Platform. In *15th ACM/IEEE International Conference on Information Processing in Sensor Networks*, IPSN '16

  Acceptance Rate: 21 / 117 (18%)

- Dawson-Haggerty, S., Krioukov, A., Taneja, J., Karandikar, S., **Gabe Fierro**, Kitaev, N., and Culler, D. (2013). Boss: Building operating system services. In *USENIX Symposium on Networked Systems Design and Implementation*, NSDI '13

  Acceptance Rate: ($\approx$ 18%)

Journal Publications

- **Gabe Fierro** and Pauwels, P. (2022). *Survey of metadata schemas for datadriven smart buildings (Annex 81)*. CSIRO, Australia

- Luo, N., **Gabe Fierro**, Liu, Y., Dong, B., and Hong, T. (2022). Extending the brick schema to represent metadata of occupants. *Automation in Construction*, 139:104307

- **Gabe Fierro**, Koh, J., Nagare, S., Zang, X., Agarwal, Y., Gupta, R. K., and Culler, D. E. (2020a). Formalizing Tag-Based Metadata With the Brick Ontology. *Frontiers in Built Environment*, Vol 6

- Krishnan Prakash, A., Zhang, K., Gupta, P., Blum, D., Marshall, M., **Gabe Fierro**, Alstone, P., Zoellick, J., Brown, R., and Pritoni, M. (2020). Solar+ Optimizer: A Model Predictive Control Optimization Platform for Grid Responsive Building Microgrids. *Energies*, Vol 13(12)

- **Gabe Fierro** and Culler, D. E. (2019b). Mortar: An Open Testbed for Portable Building Analytics. *ACM Transactions on Sensor Networks*, Vol 16(1)

- **Gabe Fierro** and Culler, D. E. (2018). Design and Analysis of a Query Processor for Brick. *ACM Transactions on Sensor Networks*, Vol 14(3–4)

- Andersen, M. P., **Gabe Fierro**, and Culler, D. E. (2017). Enabling synergy in IoT: Platform to service and beyond. *Journal of Network and Computer Applications*, Vol 81

- Balaji, B., Bhattacharya, A., **Gabe Fierro**, Gao, J., Gluck, J., Hong, D., Johansen, A., Koh, J., Ploennigs, J., Agarwal, Y., Bergés, M., Culler, D., Gupta, R. K., Kjærgaard, M. B., Srivastava, M., and Whitehouse, K. (2018). Brick : Metadata schema for portable smart building applications. *Applied Energy*, Vol 226

- Andersen, M. P., Kolb, J., Chen, K., **Gabe Fierro**, Culler, D. E., and Katz, R. (2018). Democratizing Authority in the Built Environment. *ACM Transactions on Sensor Networks*, Vol 14(3–4)

Workshop Publications

- **Gabe Fierro**, Moffat, K., Pakshong, J., and von Meier, A. (2020b). An Extensible Software and Communication Platform for Distributed Energy Resource Management. In *Proceedings of the IEEE Workshop on Autonomous Energy Grids*, SmartGridComm '20, Virtual Conference

- **Gabe Fierro**, Guduguntla, S., and Culler, D. E. (2019a). Dataset: An Open Dataset and Collection Tool for BMS Point Labels. In *Proceedings of the 2nd Workshop on Data Acquisition To Analysis*, DATA '19, New York, NY, USA

- Krioukov, A., **Gabe Fierro**, Kitaev, N., and Culler, D. (2012). Building Application Stack (BAS). In *Proceedings of the Fourth ACM Workshop on Embedded Sensing Systems for Energy-Efficiency in Buildings*, BuildSys '12, Toronto, Ontario, Canada (**Best Paper Award**)

Demos and Posters

- **Gabe Fierro**, Prakash, A. K., Mosiman, C., Pritoni, M., Raftery, P., Wetter, M., and Culler, D. E. (2020c). Demo Abstract: Interactive Metadata Integration with Brick. In *Proceedings of the 7th ACM International Conference on Systems for Energy-Efficient Buildings, Cities, and Transportation*, BuildSys '20, Virtual Event, Japan

- **Gabe Fierro** and Culler, D. E. (2019a). An Improved API and User Experience for the Mortar Testbed. In *Proceedings of the 6th ACM International Conference on Systems for Energy-Efficient Buildings, Cities, and Transportation*, BuildSys '19, New York, NY, USA

- Balaji, B., Bhattacharya, A., **Gabe Fierro**, Gao, J., Gluck, J., Hong, D., Johansen, A., Koh, J., Ploennigs, J., Agarwal, Y., Bergés, M., Culler, D., Gupta, R. K., Kjærgaard, M. B., Srivastava, M., and Whitehouse, K. (2016b). Portable Queries Using the Brick Schema for Building Applications: Demo Abstract. In *Proceedings of the 3rd ACM International Conference on Systems for Energy-Efficient Built Environments*, BuildSys '16, Palo Alto, CA, USA (**Best Demo Award**)

- **Gabe Fierro**, Rehmane, O., Krioukov, A., and Culler, D. (2012). Demo Abstract: Zone-Level Occupancy Counting with Existing Infrastructure. In *Proceedings of the Fourth ACM Workshop on Embedded Sensing Systems for Energy-Efficiency in Buildings*, BuildSys '12, Toronto, Ontario, Canada

Awards

Google-CMD-IT Dissertation Fellowship Award *One of 11 recipients of $25,000 for "positively influencing the direction and perspective of technology", in alignment with the FLIP Alliance mission.*	Fall 2020
Georgia Tech Focus Fellow *One of two students from UC Berkeley chosen to attend the Georgia Tech Focus Fellows program*	Fall 2020
David Wessel Best Demo Award *Demonstrated a VR-based network debugging platform at the CONIX Research Center Annual Review (https://conix.io/)*	Fall 2019
Outstanding Graduate Student Instructor *For service for the CS168 course: Introduction to the Internet: Architecture and Protocols*	Fall 2018
Best Paper Presentation Award *For presentation of the conference paper* Mortar: An Open Testbed for Portable Building Analytics	BuildSys 2018
EECS Chair's Special Award *For service to the department as member of the Computer Science Graduate Student Association and in helping to organize PhD Visit Day*	Fall 2016
Audience Choice Award (Best Paper Finalist) *For the conference paper* Brick: Towards a Unified Metadata Schema for Buildings	BuildSys 2016
Best Demo Award *For the demo* Portable Queries Using the Brick Schema for Building Applications	BuildSys 2016
Best Paper Award *For the workshop paper* Building Application Stack (BAS)	BuildSys 2012

Teaching Experience

Colorado School of Mines

Instructor and Course Designer, CSCI 598AB: Data Management for CPS and IoT (Spring 2022)
Instructor and Course Designer, CSCI 498AB: Data Engineering (Spring 2023)

UC Berkeley

Graduate Teaching Assistant, CS 186: Introduction to Database Systems (Fall 2020)
Graduate Teaching Assistant, CS 168: Design of Microprocessor Based Systems (Fall 2018)
Teaching Assistant, CS 194: Internet of Everyday Things (Spring 2015)
Lead Instructor and Course Developer, IEOR 290C: Introduction to Data Science (Summer 2014)

SERVICE

ACM BuildSys TPC Member	2022, 2023
ACM e-Energy TPC Member	2022, 2023
ACM e-Energy Web Chair	2022
DATA Workshop Co-Chair	2020, 2021, 2022
BuildSys 2020 Web Co-Chair	Fall 2020
EWSN 2020 Poster&Demo Program Committee	Fall 2020
Annex 81 Participant	Fall 2020 - present
ASHRAE Semantic Interoperability Working Group	Fall 2018 - present
Computer Science Graduate Association	Fall 2016 - Spring 2021
Computer Science Graduate Association (President)	Fall 2018 - Spring 2021
Bias Busters	Fall 2018 - Spring 2021
Computer Science Graduate Student Association	2016-present
Bias Busters Organization	2018-present

INVITED TALKS

Semantic Metadata and Ontologies: New View on Digital Twins for Buildings *Internal Talk — Commonwealth Scientific and Industrial Research Organisation (CSIRO)*	2023
Advances in Semantic Metadata Authoring and Harmonization *Big Data and Analytics Special Technical Group — Australian Institute of Refrigeration, Air conditioning and Heating (AIRAH)*	2023
Unlocking the potential of data-driven smart buildings *National Energy Efficiency Conference — Australia Energy Efficiency Council*	2023
Brick Schema: Why and How *Migrating to Brick Workshop — Research Institute of Sweden*	2023
A Solid Foundation: Harmonizing Brick and Haystack to Simplify the Building Metadata Landscape *Haystack Connect Conference*	2022
Getting started using Brick and RealEstateCore: examples and tools *Brick-RECCon*	2022
Major harmonization effort between two smart building metadata standards *Memoori Webinar*	2022
Brick and Mortar: Semantic Metadata for Cyberphysical Telemetry and its Context *Internal Event — Google*	2021
Self-Adapting Data-Driven Software for Buildings *Global AI Challenge Conference — EMSD, Hong Kong*	2021
Brick: Consistent Semantic Metadata for Data-Driven Buildings *Webinar: Advancements in Building Data Exchange with IFC and Semantic Web Technologies — IBPSA-USA Building Data Exchange Sub-Committee*	2021
The Data Science Lifecycle *Guest Speaker in Data Science Class — Cherry Creek Innovation Campus*	2021, 2022
Catching Up with the Brick Schema for Smart Buildings *Memoori Webinar*	2021