

RFQ Response Form

RFQ for Participation in a University/Government Research Partnership

APPLICANT INFORMATION

Applicant Name: Carnegie Mellon University.

Authorized Representative Name & Title: Ramayya Krishnan, Dean, Heinz College.

Address: 4800 Forbes Avenue, Pittsburgh, PA 15238

Telephone: 412 268 3840

Email: rk2x@cmu.edu

Website: www.heinz.cmu.edu

Partners included in this Application: [Click here to enter text.](#)

How did you hear about this RFQ? Via email

REFERENCES

Provide the name, affiliation and contact information [include email address and telephone number] for three references who are able to address relevant experience with your organization.

Please do not use employees of the Allegheny County Department of Human Services as references.

[Click here to enter text.](#)

1. Dan Gilman, Chief of Staff, City of Pittsburgh - [REDACTED]
2. Ty Gourley, Vice President, Hillman Family Foundations [REDACTED]
3. Sharon P. Minnich, Secretary, Commonwealth of Pennsylvania, Governor's Office of Administration, [REDACTED]

CERTIFICATION

Please check the following before submitting your Proposal, as applicable:

By submitting this proposal, I certify and represent to the County that all submitted materials are true and accurate, and that I have not offered, conferred or agreed to confer any pecuniary benefit or other thing of value for the receipt of special treatment, advantaged information, recipient's decision, opinion, recommendation, vote or any other exercise of discretion concerning this RFP.

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REQUIREMENTS

Please respond to the following. The maximum score a Proposal can receive is 75 points. Your response to this section should not exceed 10 pages.

Background (30 points)

1. Describe your experience and/or interest in conducting research on topics related to improving local government/social services.

A large number of faculty at Carnegie Mellon University (CMU) have both strong interest and experience in conducting research on topics related to improving local government/social services. This research at CMU has often been conducted by faculty affiliated with one of two Centers: Metro21 focusing on smart cities and the Block Center focusing on technology and society. In what follows we describe a few of these projects, including both completed projects and those in the planning stages. Some of the projects we describe were conceived in collaboration with Allegheny County Department of Human Services (DHS); others illustrate our ability to effectively partner with other local government agencies; and lastly some illustrate capabilities of our faculty that may provide new opportunities for us to complement and enhance the skills and resources at DHS.

1. We start with an ongoing project led by Prof. Alexandra Chouldechova in collaboration with DHS related to the important work the agency does screening incoming calls reporting potential child abuse and neglect. Call workers are tasked with determining whether incoming referrals warrant investigation (“screening-in”), or if they are thought to be more innocuous and can be “screened-out” without investigation. In making these difficult decisions, call workers can use information provided directly in the call, as well as historical cross-sector administrative data records maintained in the County’s integrated client service record and data management system. This information, while often very detailed, is difficult for any one individual to consistently and efficiently access, review, and synthesize in real time. To address this challenge, DHS in collaboration with a team of researchers has introduced a predictive analytics system that synthesizes historical data into a single risk score for each referral. DHS is ahead of the curve in its use of data-driven decision support tools in child welfare. However, the use of algorithmic risk assessment in the child welfare domain remains controversial, largely untested, and distrusted by many. Prof. Chouldechova’s work contributes toward the development and deployment of methodologies for improving the accuracy, fairness, and trustworthiness of risk assessment models in child welfare.

Prof. Chouldechova is part of a team currently working on the next iteration of the call screening risk assessment tool, along with a new tool that is intended to guide more proactive interventions. The new tool will allow the County to identify children from birth who are at higher risk of adverse child welfare outcomes. It is hoped that identifying at-risk cases early and delivering supportive services to those families will help improve outcomes for high risk children. In addition to benefiting children and families in Allegheny County, the project has the

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potential to have a positive impact on other jurisdictions that are looking to model their systems on what is being developed here in Allegheny County. Douglas County, Colorado, the state of California, and the government of Chile are all looking to build similar systems based on the tools and methodologies we are developing.

2. Prof. Chouldechova along with CMU colleague Anupam Datta are in conversations with DHS about expanding this project to more directly investigate trust and transparency of the risk assessment tools. The call worker is presented with the tool's recommendation and makes a decision about whether to accept the recommendation or override it. The accept or override decision may in turn be impacted by the social worker's level of trust of the tool, which may in turn be related to the transparency of the tool's recommendations. Prof. Datta has designed tools to efficiently summarize and present the key features of a child's case driving the recommendation of the risk assessment tool. The project under discussion would involve testing the addition of this feature in conjunction with the risk assessment recommendation to determine the impact on the social workers' attitudes toward the trustworthiness and fairness of the tool and their likelihood of taking versus overriding the tool's recommendation with and without the additional transparency information. In addition to solving a problem of importance to DHS, the project will push the state of the art in our understanding how people and AI tools can effectively work together in settings where decisions have significant consequences.
3. In another project under discussion with DHS, Professors Jodi Forlizzi, Mayank Goel, and John Zimmerman propose applying their expertise in facilitating context-aware computing to reducing the burden of effort that is involved in caseworkers' visits to private homes to investigate children at risk. The research team's work suggests that innovative use of sensing technology and information presentation can potentially reduce the burden of these visits for caseworkers and families being investigated. The researchers' premise is that presenting information that is known about an individual or family to a caseworker may increase trust between DHS workers and clients, therefore leading to improved workflow and better outcomes. The team's work advances the state of the art in a field known as context-aware computing by bringing the power of context-awareness to face-to-face social interactions.

Prof. Forlizzi and colleagues are conducting fieldwork on events where they expect their context-aware system to add value. For instance, at job fairs where participants know little about each other, and where contextual information may benefit both parties. The team is prototyping mobile and wearable augmented reality (AR) systems to deliver context information to people in support of their social interactions. As they refine the technical aspects of the system, they are generating a wide range of potential design solutions based on observation, synthesis, and labeling of data, followed by rapid experiential feedback. The researchers are discussing a project with DHS that may involve conducting baseline measures of DHS caseworkers about their perceived collaboration and work efficiency, iteratively deploying the mobile version of this system with DHS caseworkers, and measuring how aspects of trust and

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perceived workflow change. By working closely with DHS caseworkers, the team is confident they can create efficiencies and eventually place this system in the field in actual caseworker consults.

4. Prof. Daniel Nagin, colleague Dr. Jon Elmer (MD), and a group of Heinz College graduate students, partnered with DHS in a project focusing on the opioid epidemic. The specific goal was to identify Medicaid beneficiaries in Allegheny County who are at high risk of prescription opioid abuse for early investigation and potential intervention. The research team applied group-based trajectory modeling to classify Medicaid beneficiaries with any prescriptions for opioids into groups that either do or do not suggest likely dependency. They then assessed the accuracy of a number of techniques to classify beneficiaries as at high risk or not at high risk early in their opioid prescribing history. The methodology they applied was successful at accurately identifying those at high risk of opioid dependency in the first six months following their first prescription.

The next four projects illustrate CMU's capabilities in partnering with other local government agencies along with DHS in carrying out research to improve the lives of families in Allegheny County. The CMU faculty contributions in these projects may have as of yet undeveloped application to the services DHS provides.

1. Professors Min Kyueng Lee and Daniel Kusbit are currently working with partner [Operation Safety Net](#) to make a difference for people experiencing homelessness in our area. Every year, thousands of individuals experience homelessness in Pittsburgh. Numerous agencies offer street outreach services, but their efforts may be duplicated or otherwise hampered by challenges in effective interagency collaboration. The result can be inefficient and inequitable service delivery. Working with several local agencies, the research team has developed a tool called *Socius*, that enables location-based collaboration and predictive analytics to help agencies coordinate and develop data-driven service planning for homeless people. *Socius* is designed to increase the number of homeless people that are served and introduced to a long-term pathway to end their homelessness by helping government agencies plan new service types and locations based on the mobility and needs patterns of the homeless populations. The project team is currently beginning a pilot with [Operation Safety Net](#), one of the largest street outreach providers in the region.
2. A number of CMU faculty are involved in collaborative projects with the Latham Street Commons and local government partners including DHS, Pittsburgh Water and Sewer Authority, Partners4Work and the Pittsburgh Police. Here we describe just one of these projects led by Prof. Afsaneh Doryab addressing economic needs of one group of Pittsburgh's at-risk young adults – those aging out of foster care. These young adults experience greater degrees of economic disparity due to structural barriers between them and economic opportunities, and experience devastatingly high levels of violence, physical, and emotional abuse. While trauma

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and its effects are not limited to youth in poorer communities, the consequences for youth living in neighborhoods with multi-layered stressors can be more challenging to resolve. At the same time, our region needs a diverse workforce with 21st century literacies. The project develops an on-demand work matching tool for at-risk young adults, a novel initiative for workforce development and employment through mobile and recommendation technology combined with a nine-month training program called Night Owl Bakers (NOB) developed by the Latham Street Commons. The NOB program is a 9-month curriculum that provides a holistic approach to self-identity and employment preparedness for young adults aging out of the foster care system. The proposed system will support recommendation of on-demand work opportunities to the graduates of the NOB program that match individuals' skills, preferences, location, and environment. The research team anticipates that in five years, the on-demand work system will be a social enterprise model for others and serve as a self-sustaining source of workforce training and economic development in Pennsylvania for the disadvantaged as well as the general population.

3. Professors Alexandre Jacquillat and Sean Qian are two of CMU's faculty with extensive expertise on transportation. They are in discussions local organization Resolve Crisis Services, which provides urgent mental health support to all Allegheny County residents by traveling to a resident's location and offering face-to-face support. This and related services provide time-critical medical care; however, they often operate with limited vehicle fleets, which may prevent them from responding to some patient calls within adequate time windows. This project aims to leverage ride-sharing platforms to augment emergency care providers with distributed, on-demand resources, with the objective of enabling faster response to medical emergencies and thus enhanced care delivery. In the example of Resolve Crisis Services, using on-demand vehicles to transport patients subject to less severe crises to a mental health facility can allow other vehicles to respond to the most severe emergencies. In both examples, ride-sharing vehicles are more likely to be in the vicinity of patients than vehicles in dedicated fleets and may thus provide more timely service, while keeping dedicated capacity available for future calls. This project has three specific goals: (i) developing a data-driven approach to evaluate the geographic coverage of emergency care providers, (ii) designing operating models, including partnerships with existing on-demand ride-sharing platforms (e.g., Uber, Lyft) or creating new dedicated ride-sharing platforms (iii) developing models and algorithms to optimize the utilization of available vehicles from on-demand ride-sharing platforms (e.g., which vehicle to dispatch given both efficiency and costs, how to route this vehicle with the consideration of traffic conditions and available medical care resources) to respond to emergencies, and (iv) deploying the resulting systems and technologies in real-world settings to assess their impact on patient wait times, safety, and resulting care delivery.

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In related work, Prof. Lee Branstetter is leading a team of researchers partnering with a major ride-hailing company, DHS, and other partners to test the effectiveness of ride-hailing coupons in reducing the barriers low-income single mothers experience to labor force attachment. Public transportation has serious limitations in meeting the needs of employees outside the City of Pittsburgh in reaching better jobs within the city. These limitations are particularly acute when employees' schedules are subject to the disruptions common for those with children and other dependents. The proposed project is a randomized experiment to rigorously test whether provision of coupons for free ride-hailing improves the labor force attachment and financial well-being of this disadvantaged group.

4. The last projects are focused on public safety in Pittsburgh and the use of predictive analytics to support the Pittsburgh police and Pittsburgh Bureau of Fire in reducing and more effectively responding to risks.
 - a. Professors Wilpen Gorr and Daniel Neill lead a project designed in collaboration with Pittsburgh Bureau of Police to predict locations that will have crime flare-ups in the following week. After creating and testing this accuracy of this predictive algorithm they then designed a rigorous randomized experiment that tests whether there are reductions in crime when police patrol predicted crime hot spots versus carry out their policing as usual without knowledge of predicted crime hot spots. The experiment was also designed to determine whether effects varied for chronic crime hot spots versus locations with new and temporary spikes in crime. Early results suggest that patrolling predicted crime hot spots is effective at reducing crime.
 - b. Ph.D. student Michael Madaio leads a project in collaboration with the Pittsburgh Bureau of Fire (PBF) and Pittsburgh Department of Innovation and Performance to identify properties that are at the greatest risk of fire for prioritized inspection. The team members developed a predictive algorithm for risk of fire at commercial properties that the PBF inspects and tested it for accuracy relative to alternative predictive methods. They then created a dashboard that includes interactive map visualization for use by PBF in setting inspection priorities. The predictive model and dashboard have been deployed and are in use by the PBF. Ongoing work is further improving the predictive model and making improvements to the dashboard to improve its usefulness.

Infrastructure (45 points)

2. Describe the specific resources (academic/administrative staffing, materials, etc.) that will be dedicated to this project.

CMU has worked with Allegheny County DHS over many years. These engagements have involved student projects as well as faculty-led research. Based on this experience, we would like all relevant parts of the university to be a resource when needed based on the nature of the problem being

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addressed by DHS. We envision a close partnership that will be mutually beneficial by providing DHS with access to world-class talent and expertise, and CMU faculty and students with access to data, problems and the opportunity to have impact on important societal problems in partnership with DHS. To achieve these goals and determine the various resources at CMU that can be harnessed to support DHS, we have designed an engagement model consisting of the following elements:

- a. Guest lectures and meetings on CMU campus by Allegheny County DHS leaders and staff. This builds awareness among students and faculty of the important issues being addressed by DHS.
- b. Scheduled “mind swap” meetings between CMU and DHS staff to share information about ongoing work as well as on problems and associated data that would lead to research projects of the sort described in Section 1.
- c. The Blumstein Scholars program, a formalization of an existing model where students from CMU can get embedded as interns as well as during the course of the term at Allegheny County DHS serving as “bridges” between CMU and DHS staff.
- d. Capstone projects where work outputs are produced over a semester, Phd student projects where work gets done over the course of an academic year and shorter duration “in course projects.”
- e. Societal Challenges and hackathons involving student clubs such as SUDS (Students for Urban Data Systems) that have a large critical mass of students from across campus working on data science problems for social good.

Two university wide centers – the Block Center for Technology and Society and Metro21: Smart Cities Institute – will execute this engagement model via the partnership with Allegheny County DHS in a coordinated fashion. Their wide reach will provide the best of Carnegie Mellon to DHS. Prof. Rick Stafford, who is well known to DHS and is intimately familiar with the Block Center and Metro21 and the University, will serve as a DHS point of contact for this engagement.

The Block Center for Technology and Management (<https://www.cmu.edu/block-center/>) is devoted to research on (i) how technology and algorithms are shaping the future of work, and (ii) how to improve fairness and transparency of algorithms, which drive many critical decisions in policy making. The center is funded by the generous endowment gift provided by Keith Block, Co-CEO of Salesforce.

More than 40 CMU faculty from various disciplines are affiliated with the center and many of them have interests that are relevant to DHS. The expertise of the faculty range from machine learning, economics, program evaluation, statistics, human computer interaction, ethics and philosophy, operations research, and computer science. The workshop that hosted by the Block Center in partnership with the DHS to explore synergies on research was well attended and has already resulted in a number of interesting preliminary research project ideas.

Metro21 (<https://www.cmu.edu/metro21/>) is the University’s smart city institute. It draws faculty from across the entire university and has over 30 faculty members actively engaged in project activities with

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agencies across the city and the county. Metro21 pioneered the model of *research, development and deployment* and has worked on a variety of projects in areas including transportation, smart infrastructure, and public safety. This model has led to deployed projects which have had significant impact (e.g., the intelligent traffic lights near Bakery Square that have resulted in a 26% reduction in congestion and a 22% improvement in air quality) as well as economic development through startups. The examples of projects described in Section 1 draw on the work of faculty affiliated with the Block Center and Metro21.

Both the Block Center and Metro21 have advisory boards consisting of Deans of their respective relevant academic units at CMU. This structure will enable projects identified through the CMU partnership with DHS to involve teams of students from appropriate academic units working independently or jointly as deemed relevant by the faculty and DHS.

3. Describe the governance structure within your organization that will support this project, integrating other faculty, students, etc.

The Block Center is governed by a leadership team that includes Prof. Rahul Telang (Professor of information systems and management), Prof. Lee Branstetter (Professor of economics and public policy), Prof. Amelia Haviland (Professor of statistics and public policy), Prof. Ramayya Krishnan (management science and information systems; Director), and Prof. Tom Mitchell (Machine Learning). The Center is supported by the board of distinguished academics, public servants and business professionals. The deans of the seven schools at CMU are members of the advisory board of the Block Center.

The Metro21: Smart Cities Institute is led by Prof. Raj Rajkumar (George Westinghouse Professor, Department of Electrical and Computer Engineering, College of Engineering) who serves as Director of the center and by Karen Lightman who serves as Executive Director. Metro21 has a governance committee consisting of all the deans of the seven schools at CMU. Through these governance and advisory boards, both the Block Center and Metro21 have the capacity to engage faculty and students from across the university to successfully execute the engagement model that we have proposed.

In addition to this governance structure, coordination between Block Center and Metro21 leadership and faculty is seamless since Ramayya Krishnan and Raj Rajkumar are faculty members in and directors of Block and Metro21 respectively. Further, Ramayya Krishnan is on the executive committee of Metro21 and has been associated with it since its founding. The deep multi-disciplinary relationships that exist at CMU means that the faculty and executive directors know each other and often work together. For example, following the Block Center-hosted Allegheny County DHS workshop, transportation problems identified in the discussion led to Ramayya Krishnan and Raj Rajkumar jointly hosting a call with DHS colleagues and Metro21 faculty to explore and scope problems.

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This type of collaboration extends to educational projects conducted under faculty supervision by students (undergraduates, Masters and Ph.D.). While the DHS has worked for many years on capstone projects with Heinz College students in Information Systems and Public Policy, both the Block Center and Metro21 have the capacity to work with colleges and schools at CMU to create both disciplinary and multi-disciplinary teams of students (e.g., students in public policy, engineering, business or design) depending on the nature of the problems. Based on DHS bandwidth and problem identification, we anticipate at least two capstone projects per term with DHS. Each capstone represents close to 2,000 hours of effort from students. We expect the student involvement will span all seven colleges at Carnegie Mellon bringing their unique skill sets to the problem in question.

Finally, in addition to research and education, we propose to formalize the Blumstein Scholars model wherein students from CMU spend time in-residence at the DHS for data collection, understanding context, and implementing research design. This provides a great opportunity to understand DHS problems in detail and propose solutions that are practical and implementable for the DHS. The student internships will also create the necessary groundwork for deeper research partnership between CMU and DHS. Both the Block Center and Metro21 have access to funds or will seek funding from federal and foundation sponsors. The partnership with DHS will not require outlay of funding from DHS, but will present CMU and DHS an opportunity to partner around additional educational and funding opportunities from other sources.

As noted previously, long-time faculty member Rick Stafford will serve as point of contact as we establish and develop this relationship. In summary, the organizational structure of the centers leading this initiative is well suited to the needs of this important partnership and will help drive mutual benefit to CMU and DHS, resulting in greater ability to meet the needs of the residents of Allegheny County.

4. Describe activities, such as internships and fellowships, that will support this project. The nexus of technology, society and humanity is an area of strategic importance to CMU. While the faculty associated with the Block Center and Metro21 bring deep research strengths at this intersection to the table, our engagement model described in Section 2 has an intentional focus on students and experiential education. This student engagement and experiential education will be coordinated via colleges and schools that deliver academic programs. As described in Section 3, our governance structure enables the Block Center and Metro21 to partner effectively with all schools and colleges at CMU around experiential education. While professional colleges, such as the Heinz College, have long had a focus on experiential learning, it is fair to say that both the faculty and students often feel disconnected, organizationally and even culturally, from the many government agencies that are on the front lines of serving these disadvantaged communities. That distance prevents agency practitioners from taking full advantage of our expertise and technology. It also keeps our faculty members from identifying transformative research opportunities where new science could address the existing knowledge gaps undermining the effectiveness of policy practitioners. Sometimes, the inability to anonymize data might limit data sharing across agency organizational boundaries. We propose the

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following mechanisms to support this partnership between the DHS and CMU through experimental learning engagements, ranging from a semester to as much as a year at a time.

Internships and Fellowships: The Blumstein Scholars program

Over the years, CMU students, primarily from the Heinz College, have undertaken summer internships, work study fellowships and worked on applied projects under the guidance of faculty members and DHS staff. Today, we have more than 15 Heinz College alumni employed at DHS and each year students obtain internships with the agency. Our proposal is to elevate what has worked to date, formalize it as a distinctive experiential learning program, and name it in honor of former Heinz College Dean and long-time faculty member Alfred Blumstein. We would raise funds and/or leverage named scholarships/fellowships dedicated to economic and social development in the community to support this program. By naming students who participate in it as “Blumstein scholars,” we expect to attract outstanding students interested in working on CMU-DHS projects. Since a Heinz College funded version of this model exists, we expect that we will be able to deploy the program as soon as the partnership is formalized while working toward raising monies to endow the program in the long term.

Partnering with DHS to attract Top Talent and enable Upskilling of the County Workforce

Upskilling the government workforce to build a “data culture”¹ is an important attraction and retention strategy and ultimately leads to better decisions. This strategy has two components that make it a natural fit for a top university. First, attracting top talent requires early engagement. Student projects, case competitions, internships and classroom lectures would excite students about the societal impacts they could make in government roles long before they make their career decisions. This is a strategy that leading private sector firms use to attract talent. Secondly, current high-potential government employees need to continue to refresh their skillset and learn new tools and techniques. Through this arrangement, we could allow select DHS employees the opportunity to audit up to 24 units of Heinz College courses as a non-degree student.

Such collaboration will yield three critical benefits:

- 1) Students and faculty will acquire a much deeper understanding of the social problems we seek to solve;
- 2) Agencies will be endowed with a richer set of skills and capabilities;
- 3) CMU will train a new cadre of graduates uniquely equipped to bridge the gap between theory and practice -- graduates will have had the experience and training to make a significant impact on the local community.

¹ “Why Data Culture Matters. McKinsey Quarterly. Sept 2018