FEEDBACK REPORT ON:

ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

MARCH 10TH, 2021
VIA ZOOM
SAN JUAN, PUERTO RICO

Overview

The Research and Innovation Meetups are done with the intention of exploring perspectives, generating alignment, as well as points of intersection, between the agendas of research, existing resources, and market opportunities; and to highlight Puerto Rico's intellectual capital in order to promote improved technology transfer, development, and commercialization of our intellectual property. The Meetups serve as a vehicle to present the new resources made available by the Trust in these areas while simultaneously building an audience base that will provide the critical mass for ecosystem development in specific fields.

Key points regarding the Meet Ups

Foster encounters, sharing, learning, and improvement

The proposed event seeks to bring together key staff from public and private colleges and universities, private sector stakeholders, civil society organizations in charge of community economic development, business incubators, and key government players in the areas of high potential for economic development and education.

### Discussion of important topics pertaining group dynamics and interests

The content agenda revolves around: public policy and indicators for innovation, research and development; technology transfer for innovation; and a new ecosystem for innovation in a variety of sectors within the Island's economy. These subject matters are discussed in a variety of formats, from traditional presentations, workshops, panels, round tables and other open discussion formats.

Increasing social capital by providing space and context from which to engage in crossed networking

The Meetups are geared at creating opportunities for participants in the fields of research, investment, business entrepreneurship, social enterprising, in order to form bridges among groups, promote understanding through social interaction, and empower innovation.
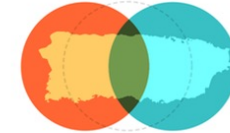
This Meetup event is the first of a series of facilitated dialogues by the PRSTRT, cognizant that we shall not remain on the sidelines as it relates to the increasing wave of digitization that is sweeping the globe… In the effort of supporting the development of an Ai ecosystem in Puerto Rico, we are most interested in understanding: what is happening in PR as it relates to Ai? Who are the players? What shows promise and opportunity? How do we improve talent development on the Island to that end? And, most importantly, what are the challenges and barriers to make this happen?

We had the privilege of having a distinguished group of subject matter experts whose intervention allowed for a better understanding of the importance of working on the intersection of research and business development, the needs they face in the effort of growing their areas of practice, as well as the future expectations for their respective businesses. This exchage set the stage for two dialogues focused on the development of the ecosystem from the demand and supply sides, the result of which is summarized in this document.

In conclusion, the event validated that Puerto Rico's Ai ecosystem is more active than originally thought of. A new kind of entrepreneurial leadership that is understanding of our potential, cognizant of our challenges, and approaches these issues from the vantage point of solidarity and innovation for citizen wellbeing. This is an asset moving forward, as precisely this attitude the one that the Trust seeks to support, and we will need these academic and business leaders to engage mentoring opportunities and serve as role models for a new cadre of tech professionals and new entrepreneurs in order to generate the conditions that improve our quality of life.

You may see the video product of this meetup using the following links:

Meetup Artificial Intelligence & Machine Learning – Episode 1

Meetup Artificial Intelligence & Machine Learning- Episode 2

PR RESEARCH & INNOVATION

Meet-up

ARTIFICIAL INTELLIGENCE & MACHINE LEARNING

📅 **10 de marzo, 2021**
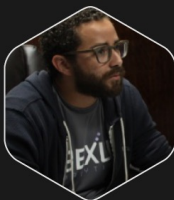
🕐 **9:00 a.m. -12:30 p.m.**

Puerto Rico Science, Technology & Research Trust

CONFERENCIANTES

Christian G. González
Wovenware

Eduardo Burgos
Abexus

Mariano de Socarraz
CorePlus

Adam Beguelin
Holberton School

Shaun Moore
Trueface

Jesus Bernardy
Celerops

Daniel Alvarado
Celerops

Luis Torres
Engine 4
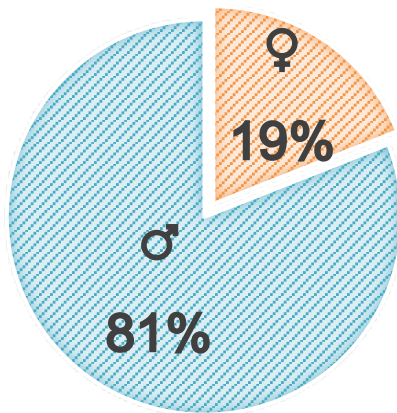
Miguel Vélez Rubio
UPR Bayamón

Agenda

AGENDA
Meetup on Artificial Intelligence and Machine Learning
MARCH 10th, 2021

Time	Session	Speaker
9:00 am	Registration	Ernesto Cruz *Research & Innovation Meetups Program*
9:00 am	Welcome	Lucy Crespo, CEO *Puerto Rico Science Technology and Research Trust* Sebastián Vidal, CIO *Puerto Rico Science Technology and Research Trust*
9:10 am	Ai/ML Opportunities in Puerto Rico	Adam Beguelin, *Holberton School*
9:30 am	Interactive Showcase Presentation	Juan Figueroa, *SBIR/STTR* Christian González, *Wovenware* Humberto Pertuz, *VOZY* Jesus Bernardy/Daniel Alvarado, *Celerops* Shaun Moore, *Trueface* Abiel Roche-Lima, PhD, *UPR- Medical Science Campus*
10:00 am	Interactive Discussion Panel	Eduardo Burgos, *Abexus* Mariano de Socarraz, *CorePlus* Luis Torres, *Engine4* Miguel Velez Rubio, *UPR-Bayamón*
11:00 am	Breakout Session (Demand Side)	Ricardo Burgos, Facilitator
	Breakout Session (Supply Side)	Ernesto Cruz, Facilitator
12 noon	Round Table Discussion Reporting Out Session	Ernesto Cruz, Facilitator
12:30 pm	Wrap Up	

Puerto Rico Science, Technology & Research Trust

PR RESEARCH & INNOVATION Meetup

Attendance Analysis
Stakeholder mapping

GENDER DISTRIBUTION

♀ 19%
♂ 81%

STAKEHOLDER DISTRIBUTION

US Federal Government 1%
PR Government 1%
International 1%
NGO's 4%
Trust 3%
Private Sector 39%
Indiviuals 18%
Academia 33%
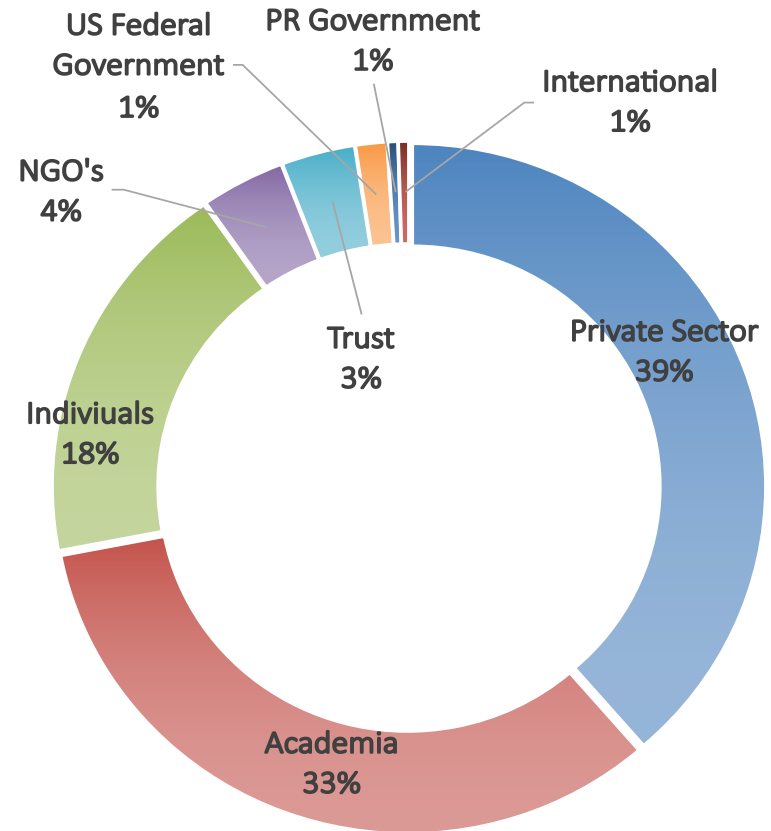
Observations

- **Reservations vs. participation.** 250 Reservations… Peak attendance of 161 participants
- **Gender**. In comparison to other events, women are a growing minority in the audience.
- **Stakeholder composition**. Led by private sector, with strong academic component.

Puerto Rico's Ai ecosystem at a glance

- There is ample opportunity for growth in both the demand and supply sides

- Capacity building and Talent development
    - USC has offered courses, but they were ahead of the market...they needed a higher level skillset to engage Ai/ML.
    - High demand for coders (in PR and globally)...it's a more egalitarian labor market (it doesn't matter if you're 16 or 60)
    - Capacity building initiatives are taking hold, and the supportive structure is also underway
        - New students need to aproach understanding neural networks in an artisan-like manner (building models, cloud computing, dev ops skills, coding, server mgmt.)
        - Attracting math students for tool development in the deep details of the model, so machine learning can be a bait to attract folks to increase the Ai/ML talent base.
        - The math background is somewhat challening at present.
- Data
    - Where can we get data?
        - Roadways (sensors, cameras)
        - Manufacturing companies (IT, pharma, mfg. processes)
        - Think of what information you have that may help you improve the decisionmaking for your business.

- New Business models arise (work with clients, work with data, new vesting models)
- Timing and reach in the ecosystem is key for business success
- There is a future in pattern recognition (as in voice and businesses processes) that signal market potential for growth

Puerto Rico's Ai ecosystem at a glance (cont.)

Current areas of work
- Deep Learning technology development
- Machine Learning technology development
- Synthetic Data
- Computer Vision
- Face Recognition
- Voice Recognition
- Image Recognition
- Machine Learning

Existing jobs in the ecosystem
- Data scientists
- Data specialists
- Developers & Coders
- Analysts
- Designers (UX/UI, VUX/VUI)
- Engineers (software, sound, knowledge
- Project Managers
- Social scientists
- Linguists

Industries serviced
- Health
  - Bioinformatics
  - Imaging Informatics
  - Clinical Informatics
  - Public Health Informatics
  - Pathology - Laboratory
- Pharma
  - Manufacturing
- Defense
  - Imagery analysis
  - Face Recognition
  - Voice Recognition
- Fin Tech

Research and Innovation Showcase
Presenters

Some of the Puerto Rico based/supported players in the market that were highlighted in during the Meetup include:

- **PRSTRT SBIR STTR Program** – Equity-free financial support for research and development • PRSTRT supports grant application process for potentially successful ideas.

- **Wovenware** – 140+ staff • Specialized in deep learning and computer vision • Clients in industries like defense, pharma, and health industries • SBIR applicant Submitted Patent • Recognized by IDC, Gartner, Forrester (Computer Vision Consultancies Wave), INC 5000 List of high-growth companies.

- **TrueFace Ai** – Facial Recognition technology to run in a variety of devices • P18 alumni • Operations in 13 countries • Clients industries like defense and hospitality • Two active SBIR grants • 4 active government contracts in the U.S. • Top 3 by the National Institute of Stantards And Technology

Other Puerto Rico based/supported players in the market that were highlighted in during the Meetup include:

- **Vozy** – Voice Recognition technology through Lilli, an Ai digital assistant that uses speech analytics and voice biometrics • P18 alumni • 1 active government contract (re COVID-19) • Strong collaboration with universities, Holberton School, and technical teams.

- **Celerops** – Process Improvement, Automated Processing through ML, Business Process Reengineering (BPR), and Robotic Process Automation (RPA)• Clients in industries like Accounting, Aerospace, Health.

- **UPR Medical Sciences Campus** – Academic Research in Ai and ML applications in biomedical sciences • Offer a Professional Certificate in Data Science (457 graduates since 2018) • Publications in Pharmacogenetics, Pharmacology, and Stroke Research and Treatment • Research activity funded by the Center for Collaborative Reasearch in Health Disparities • Currently researching potential clinical applications in personalized medicine.

Interactive Discussion Panel

Puerto Rico based players in the market that were invited to share insights in a panel discussion:

- **Abexus** -
    - Programming skills need to become part of the core curriculum, as it becomes a growing requirement of new jobs in the 21st century.
    - Multidisciplinary skillset is a plus for a more well-rounded professional that uses data in their work (taught using technology to solve real-life problems).
    - This discussion helps normalize the discussion on the use of technology for day-to-day adoption and adaptation
    - We need to reduce the bias of companies, especially those who still don't hink of themselves as data driven organizations.
    - Brands of PR is a good case study to demonstrate the value of Ai/ML in understanding behavioral economics.
    - The educational space is being tranformed. Programming skills need to become part of the core curriculum, as it becomes a growing requirement of new jobs in the 21st century.
    - Multidisciplinary skillset is a plus for a more well-rounded professional that uses data in their work (taught using technology to solve real-life problems).
    - This discussion helps to normalize the discussion on the use of technology for day-to-day adoption and adaptation
    - We need to reduce the bias of companies, especially those who still don't think of themselves as data driven organizations.

- We're all generating a lot of data...how do we use it or how do we plan to use it? Private sector could help government in understanding the value of data and taking the proper steps for a more data-based public policy administration. The digital transition will take us there in the next 10 years, and businesses who don't jump on the data bandwagon will have to design how to keep adding value to their clients.

- **CorePlus**
  - Leading entrepreneurs in the Ai/ML field in PR have taken to self-teaching in order to develop new business tools based on Ai algorithms to create a heat map that aids their precision medicine practice. 2000+ cases validate their new technology, which will transform the practice of pathology, as Ai/ML will facilitate a triage system to improve the effectiveness of the clinical practice, which in turn calls for new educational curricula...we have a responsibility to improve our talent base in Puerto Rico.
  - We will have significantly more information to engage in predictive analysis in the health industry.
  - Market examples include Ibex (closed Series B funding for $38MM and Paige (closed a Series A/B for $128M), which signals a lot of room for market penetration.
  - The world is our market... theirs is a unique technology in the Americas.

- They work in collaboration with Abexus, which helps them in attainment of one of their goals: to become an organization that speaks in metrics… a data-based dialogue culture that is being implemented in the organization…shifting from a qualitative language to a quantitative language.

- **Engine 4**
  - Facilitators and motivators from mid and high schools on issues related to 4.0 technologies… python programming
  - Various Ai/ML projects underway,
    - Data analysis from the PR Observatory in Arecibo
    - Precision agriculture project (sponsored by Microsoft and T-Mobile)
    - Assisted in the process of curricular change for UPR Bayamon Campus for 4.0 technologies, which also includes hardware and entrepreneurship in the curriculum
  - Working strongly with younger aged groups (10 yrs. old +) as they recognize a disparity among students in private and public schools, given their social circumstances, role modeling, and mentoring opportunities.

- On collaborations…
    - Alliances with UIAPR, UPR, U. Central Florida, Purdue U, MIT, among others…this network has helped them widen their perspective and diversify their offering.
    - Companies like Google, IBM, HP are setting up server operations in their campus to support their mission.
- Students have developed projects in the fields of renewable energy, precision agriculture,
- Looking to impact society and younger aged groups as they move to support curricular change to support their education and the prospects of future employment.
- Support for teachers is key, especially in the learning of new technologies, as the student leaves but teachers stay…

- **UPR Bayamón**
    - The curricular adaptation is underway (accredited by ABET), as the UPR seeks to adapt to changing times with a new 135 credit program for a B.S. in Technologies in Information Engineering (*Bachillerato en Ciencias en Tecnología de Ingeniería de la Información*), and a new online professional certification program (soon to be launched) that address issues like:
        - Computer Science (Ai, IoT, big data, database management)
        - Electronics (IoT)
        - IT

Interactive Discussion Panel (cont.)

- New 53,000 SF facility
- Student projects reflect talent and creativity, as they produce ideas like:
    - Predictive analysis for COVID-19 cases
    - VR integration

- Collaboration for innovation
    - Engine4
    - PRITS
    - Municipal governments
    - PR Government agencies

- The new online certificate program will launch in 2021 to address issues like
    - Innovation and Technology
        - Business development
        - Creativity and Innovation
        - Operational Strategies
    - In process – Entrepreneurship, Big Data certifications

- Access to data… big business, government

- Talent… sourcing, development

- Skill set differentiation is key to diversify the awareness and capacity building as an Ai service for the rest of the fields, its going to be a challenge to get all professionals to shift their practice to Ai based practices. Thus we become a resource to expand the use of technology.

- For Growth…
    - Recruitment of new talented staff
    - Adoption and acceptance of technology
    - Funding beyond SBIR (100-150k)… higher levels of funding is necessary, higher levels of risk aversion is also necessary for this

- New business models
    - How do we sell this? How would companies consume it? This calls for new HR training so as to organize data to address customer challenges

The agenda for change...

Opportunities to look at...
- **Fin Tech**. These are the biggest investors in analytical tools.
- **IoT**. As a key vehicle for Ai/ML applications.

- Get **buy-in from the central government**

- **Transform the K-12 curriculum**, as commented on the chat: *Hay que implementar un currículo de literacia y ciencias de cómputos de Lenguaje y Pensamiento Computacional desde los grados primarios y crear una cultura STEM. El currículo de matemática hay que repensarlo y renovarlo radicalmente desde una perspectiva educativa STEM desde los grados primarios, vocacional hasta la Academias Universitarias. El rol del maestro de ciencias, matematicas y Tecnologías es vital y hay que someterlo a una rigurosa recertificación profesional STEM longitudinal incentivada y compensada económicamente. La UPR RP cuenta con varias iniciativas de STEM PBL, etc.*

- **Multidisciplinary and inclusive approach**, as commented on the chat: *El enfoque en este campo necesita un acercamiento multidisciplinario e inclusivo...*

- **Need to focus on the ethical considerations of developing Ai/ML technologies as we move into the future**, as commented: *¿Cómo se atiende el indice social en torno a lo que ya muchos paises han acordado: SGD 2030? Eticamente debemos responder a lo social y no a lo economico pues entonces la cosa se queda igual : desbalance y no equidad.*

- **Engage a lifelong learning mentality**, as commented: *Crear una cultura de que todo lo que uno aprende es GANANCIA. Ser un autodidacta 24/7.*

- **Engage case study development to raise awareness and increase adoption**. *El puente con las industrias y empresas privadas se construye mostrandoles (case studies) aplicables a soulcionar SUS problemas mejorando asi sus $$$.....*

- **Make use of SBIR and STTR programs** as potential, equity –free funding sources. PRSTRT supports the grantwriting process of talented and promising ideas.

Audience Feedback
Roundtable Discussion / Breakout Session – Supply Side

Widen the audience group to include…
- PR Government
    - CIO
    - PRITS
    - Security
    - Department of Economic Development & Commerce (DDEC)
- US Federal Government
    - Small Business Administration (SBA)
- Private sector companies in the following industries
    - Security
    - Health
    - Education
- Rock Solid Technologies (https://www.rocksolid.com/ww), Ausubo Ventures (http://ausuboventures.com/Index.html), were mentioned as companies to approach in order to engage in potential collaboration.

Future discussion topics need to include**:**
- The use of technology to improve public policy
- Blockchain
- Cryptocurrencies
- Imagery analysis
- Hyper and multispectral analysis
- Cultural heritage conservation

Roundtable Discussion / Breakout Session – Supply Side

What hinders demand…
- There is an adoption boycott on behalf of government to incorporate technology in its operations, an issue that can be addressed by changing the mindset of businesses and organizations so they realize and understand the value of data, and themselves as data organizations holding a vast amount of data wealth.

What to do about it…
- Produce events with academia and private sector to demonstrate the interdisciplinary nature of Ai/ML across academic disciplines beyond technical/ technological progtams.
- Open events to
- Compliment working teams with quantitative thinkers vs qualitative
- Create products to facilitate the storytelling of Ai practitioners and clients.
- Go back to the hackathon experience… challenging is more inviting and an invitation *per se*.
- Regional, community-based, issues/needs-based discussion (equity, ethics) to advance common understanding
- Ask ourselves: How do we teach problem-solving from an interdisciplnary point of perspective.
- Create an Ai working group in Puerto Rico.

- What do we need on the supply side to stimulate adoption, cultural change for the development of a healthy Ai ecosystem?
    - Private sector is not familiar with these topics. Real case studies help demonstrate the value of Ai/ML.
    - Day to day does urgencies limit the possibility of having CIOs, consultants speaking to business leadership on the value of Ai, its ROI (tangible and intangible), and how pipelines should change accordingly.
    - Go to all trade groups and professional organizations
        - PR Chamber of Commerce
        - PR Manufacturers Association
        - PR College of CPA's
        - PIA
        - MIDA
        - Other small business organizations

- Microsoft sponsored a research on Impact of Ai on Puerto Rico's Economy. There is a call to action to identify and share this document. If we adopt Ai in PR our GDP would (moderately) increase 2.7% by 2030.

- Amazon will be offering courses on the tools for development they use. To know more about this please see: _____ contact Juan Figuieroa for detail.

- Request for Solution – a prized program to address solution design for stated problems/challenges to solve

Roundtable Discussion / Breakout Session – Demand Side

- **What do we need on the supply side to stimulate adoption, cultural change for the development of a healthy Ai ecosystem**
  - Private sector is not familiar with these topics.
  - Senior management's day schedule doesn't include setting time aside to work on innovation initiatives consisting of AI solutions.
  - There is an opportunity to educate the private sector through workshops on AI solutions and possibilities.
  - Go to all trade groups and professional organizations
    - PR Chamber of Commerce
    - PR Manufacturers Association
    - PR College of CPA's
    - PIA
    - MIDA
    - Other small business organizations

- Microsoft sponsored a research on Impact of Ai on Puerto Rico's Economy. There is a call to action to identify and share this document. If we adopt Ai in Puerto Rico our GDP would (moderately) increase 2.7% by 2030.
- Amazon will be offering courses on the tools for development they use. To know more about this please contact Juan Figuieroa for details.
- Open a "Request For Solutions" program focused on creating a list of the challenges that can potentially be addressed with AI solutions.

Event Analysis
Commitment, collaboration, and next steps moving forward…

- Paula Villamarin: Ponemos a disposición de las universidades trabajando con ML /computer vision nuestra plataforma para anotación de imágenes, de forma gratuita. Dejo mi correo: paula@linkedai.co

- *Mariano de Socarraz (CorePlus)* and José Bartolomei-Díaz (*The Outcome Project)* made themselves available to support the ongoing dialogue of this group. We appreciate their initiative!!

- Jorge L Herrera anuncia que en el Observatorio de Arecibo tenemos una posición abierta para desarrolladores con experiencia en el tema de AI/ML: https://jobs.ucf.edu/en-us/job/499909/arecibo-software-engineer-ii

- PRSTRT is ready to support SBIR/STTR applications from individuals and organizations in the Ai ecosystem.

- We would like to know more about our audience, so we will be sending out a brief survey that will allow us to engage in stakeholder, asset mapping, as well as the identification of new areas of interest and topics for discussion. We appreciate your response and input!

- Our next meeting should take place in Q3 of 2021. To that end, be on the lookout for a Save the Date promo!

Event Analysis Observations

Leadership, emerging social capital
As we foresaw, this event was of great interest. Ever since COVID-19 forced us to change into a Virtual Meetup format, this has been the Meetup with the most reservations (250!). Also, we are very pleased to see our events led by participants and players in a rich and diverse ecosystem that holds much promise for Puerto Rico's future.

From the vantage point of the Trust, we will continue to support and weave the social capital fabric in Puerto Rico. The feedback received indicates support for these open spaces for continued dialogue of our Island's future.

We recognize the voices that pointed to the capacity of event participants, as well as other NGOs, working groups, and other persons to craft a discussion agenda and work –in concert- towards the future that we all see as possible.

Strengthening linkages between academia and the private sector
Several voices were heard echoing this headline. The exploration of internship experiences, on the job training, and mentoring, represent viable talent development strategies, which could have an effect of putting brakes on the brain drain.

Government Relations
The use of technology to improve public policy management and accountability is gaining traction and media attention. These circumstances may very well constitute opportunities to increase the dialogue, as well as the exploration of potential changes to how the public sphere manages itself in the future.

Event Analysis

Comments on the event

Muchas gracias por hacer este meetup.
– Elias Beauchamp

Agradecemos a Christian y su socio Carlos Melendez, por el apoyo que nos están brindando enseñando un curso de Web Dev para nuestros estudiantes en Sagrado.
– Jorge Silva Puras

Estamos a las ordenes de todos lo que quieran mover a PR hacia adelante. Gente como ustedes en Sagrado, el Fideicomiso y P18, Luis Torres en Engine4…
– Christian Gonzalez

Estimados Lucy, Sebastian, Juan, y Ernie, me tengo que retirar a otra reunión pero los felicito por tan excelente actividad e intercambio!!! Sinceramente,
– Carlos Rivera Vélez

Gracias, excelente oportunidad de crecimiento.
– Rafael López Ramos

Comments on the event

Gracias por la oportunidad de participación en esta conferencing. Interesante este campo de la tecnología IA y ML.
- Luis A. Rosario-Arroyo

Este fue un evento excelente. Muchas gracias.
- Sergio Laureano

¡Gracias!
- José Cruz

¡Excelente!
- Aristides Colon Pena

Additional references mentioned throughout the event

- https://www.holbertonschool.com/campus_life/san_juan

- www.wovenware.com

- https://www.nvidia.com/en-us/data-center/a40/

- Microsoft+AI+educación - Upcoming info sessions: https://www.microsoft.com/en-in/campaign/microsoftAIforstudents/

- Para las personas desarrollando Computer Vision, tenemos esta herramienta para etiquetado de datos que se puede usar de forma gratuita: https://platform.linkedai.co/

- For SBIR-STTR program assistance, please see: https://prsciencetrust.org/sbir-esp/ or contact Juan Figueroa (jfigueroa@prsciencetrust.org)

- For the STEM Education Programassistance, please see: https://prsciencetrust.org/stem/ or contact the STEM Education Program Director, Jorge Valentine (jvalentine@prsciencetrust.org) is the