Regional Workforce Advisory Meeting
Information & Communication Technologies:
Artificial Intelligence and Data Analytics
Friday, November 6, 2020 | 9:00 AM - 11:00 AM

Individuals in attendance included: [Participant List Attached]

Welcome and Introduction
Trish Kelly - Managing Director, Valley Vision

Goal: Engage system partners and work with employers to understand workforce needs and provide this information to education partners to make sure resources and programs are geared towards the needs of the economy and provide viable pathways to quality jobs to students and workers.

This meeting focuses on artificial intelligence (AI) and data analytics. Technical requirements of these occupations will be discussed, as well as how they display and manifest in other industry sectors.

Cornelius Brown - Regional Director, Employer Engagement, ICT/Digital Media, Greater Sacramento Region
For our K-14 partners and employers, let's consider ways to engage in a meaningful way, where we can learn from one another regarding pathways for our students so that they can achieve success.

Labor Market Trends and Occupations
Ebony Benzing - Research Manager, North Far North Center of Excellence

Information and Communication Technologies/Digital Media (ICT-DM)
ICT-DM Sector Definition encompasses: Media and Communications, Information Technology, Digital Media, Telecommunications, and Geographic Information Systems. Today's focus is on Information Technology and Digital Media

Occupation Overview
ICT-DM Employment at a Glance**
- 44,964 jobs in 2019
- 47,179 projected jobs in 2024
- 5% projected job growth
- 4,354 annual openings, 2019-2024
- $38.56 Average median hourly earnings

**Does not include any other impacts of the pandemic on the workforce. Data comes from a quarterly census of employers.

Computer User Support Specialists and Project Management Specialists represent more than half of the jobs in this part of the ICT-DM sector in the region. Above average growth in Software Developers, Web Developers and Digital Interface Designers, and Information Security Analyst occupations beyond the overall 5% growth in the region. Three occupations that are projected to decline include Computer Programmers, Data Entry Keyers, and Desktop Publishers. This decline may be due to an increase of specialization in skill sets that are incorporated into other occupations. Data Entry Keyers and Desktop Publishers are also occupations that are becoming outdated, which may contribute to their decline.

ICT-DM occupations work in many industries throughout the region. More than half of the IT and DM jobs are found in eight industries in the area, which include Government, Computer System Design. Remaining 46% spread across 250 other industries in the area.

Demographics
More than half of jobs are primarily staffed by individuals who identify as nonwhite or multiracial. There is a significant disparity in gender; 60% of workers are male, and less than 40% are female. 20% of workers are concentrated in the 55+ age group.

Job Postings Data
90% or more of jobs are posted online, and are therefore thorough enough to be considered representative of the job postings universe. Around 25,000 job postings over the last 12 months (Nov. 2019 - Oct. 2020) in the Greater Sacramento Region. Location with the greatest amount of postings is Sacramento, with 13,563 postings.

Employer types include insurance companies, universities, health care systems, online companies, and other contractors. Top employer is Anthem Blue Cross, with 416 postings. A significant number of postings did not specify, but a majority of employers are searching for candidates with a four year degree (39.9%) and with 3 to 5 years of relevant experience (31%).
Hard-to-Fill Jobs in Greater Sacramento
Data Warehousing Specialists - 167 postings (medium); 54 days to fill (much harder); 0.8 location quotient (low).

Employers:
Anthem Blue Cross
Deloitte
University of California
Zeektek

Centene Corp
Blue Cross Blue Shield of California
Accenture
Amazon

Most Requested Skills:
SQL
JavaScript
Software Development
Customer Service

Java
Project Management
Software Engineering
Oracle

College Programs and Awards
Training Providers in North (Greater Sacramento)
List isn’t exhaustive but gives an idea
Community Colleges:
American River
Folsom Lake
Sacramento City
Yuba

Cosumnes River
Lake Tahoe
Sierra

Bachelor-Granting Institutions:
CSU Sacramento
William Jessup University

UC Davis

Other Postsecondary Training Providers:
Charles A Jones
MTI College
Asher College

CET Sacramento
University of Phoenix

Large number of awards in Computer Infrastructure and Support. Many programs cross-train for occupations, so it may be more difficult to target an area of specific focus. Highest number of given awards is Associate of Science (A.S.) degree with 210 awards, second is Certificate, 18 to 30 units with 113.

Other Considerations
In the spring of 2020, Valley Vision, in collaboration with COE and 4 regional workforce boards, released a report focused on impact of AI and automation on jobs in the capitol region. People who are most impacted by automation adoption will be workers with lower levels of education, in low wage jobs, women because they tend to be employed into occupations that have higher levels of automation risk such as office related jobs and fast food workers.

2017 Brookings Study conducted on behalf of Valley Vision: Black and Latino residents are less likely to have levels of digital/tech skills needed to compete in a fast changing economic environment.

Future of work will require both Upskilling and Reskilling
- Upskilling - When workers gain new skills to do work required in current jobs
- Reskilling - Workers need new skills to take on entirely different roles

Consider context of ICT-DM programs as they relate to other CE pathways. Where is there opportunity for cross-disciplinary work? Equity gaps introduce questions such as: Who’s missing from programs? Where is there opportunity to bridge the gap?

Presentation: “Re-Imagining the Future with AI”
Dr. Harsh Verma - Chairman, Association for Computing Machinery (ACM) Sacramento Chapter, Intel IOT Advisory Board Member

Artificial Intelligence
Artificial intelligence is the capability of a machine to imitate intelligent human behavior. Intelligence exhibited by machines:
- Artificial Intelligence (AI)/Narrow or Weak AI - Expert systems that match or exceed human intelligence in a
narrowly defined area, but not in broader areas (ie. GPS, Siri, Alexa)

- Machine Learning - "A computer program is said to learn from experience $E$ with respect to some class of tasks $T$ and performance measure $P$ if its performance at tasks in $T$, as measured by $P$, improves with experience $E$.

There are two types of AI:
- Rule-Based AI - Rule-based systems are constructed using automatic rule inference, from a starting set of data and rules.
- Data-driven AI - Data-driven systems can measure, understand and take decisions based on previous data, which goes on increasing.

Rule-based AI can never be more intelligent than its creators, but data-driven AI can.

### AI, Machine Learning and Data Analytics

AI is any technique that enables computer to mimic human intelligence. Machine Learning enables machines to improve ast Tasks with Experience. Data Analytics is the process of analyzing raw data - inspecting, cleansing, transforming and modeling the data with the goal of discovering useful information and to find trends. Deep learning consists of algorithms that permit software to use artificial neural networks and train itself to perform tasks efficiently

The biggest transition with AI is going to be evident in the labor markets. The labor market may see the maximum utilization of AI and robotics Huge potential for AI with Internet Of Things (IOT), across all major sectors, starting with factories and industrialized IOT, to applying AI to cars, transportation, agriculture, and healthcare, which could be as high as $11 trillion per year in 2025

### Ai in Self-driving and autonomous cars

Ford, Google, Tesla, BMW are all working towards self-driving cars

### Student-Workforce Training

AI4K12 framework has provided a framework for AI training, called Five Big Ideas in AI
- **Big Idea #1: Perception**
  - Computers perceive the world using sensors
  - Make computers “see” or “hear”
  - Computer vision: object recognition and face recognition
  - Algorithms
  - Visual interfacing

- **Big Idea #2: Representation and Reasoning**
  - Agents maintain representations of the world, and use them for reasoning
  - Data structures and representations
  - Types of reasoning algorithms
  - Path planning for self-driving cars
  - Search tree for tic-tac-toe

- **Big Idea #3: Learning**
  - Computers can learn from data
  - What is learning?
  - Approaches to machine learning
  - Fundamentals of neural networks (Examples: Google translation and Amazon AWS DeepRacer)

- **Big Idea #4: Natural Interaction**
  - Intelligent agents require many kinds of knowledge to interact naturally with humans
  - Humans are among the hardest things for AI software agents to understand
  - Natural language understanding
  - Common sense reasoning
  - Human-robot interaction
  - Gesture and facial expression recognition

- **Big Idea @5: Societal Impact**
  - Artificial intelligence can impact society in both positive and negative ways
  - Economic impacts of AI
  - Ethics of AI making decisions
  - New services using AI
  - Increase efficiency
  - Responsible AI for Social Empowerment

### Future Worlds - Edge AI, IOT and Cyber-Security

Edge AI has a wide range of requirements. OpenVINO offers open source visual sensing. Can accelerate and deploy convoluted neural networks.
**Employer Panel Discussion/ Q&A**

The following panelists aimed to inform community college curriculum:

- Américo Carvalho - Sr. Manager, AIML & Edge, World Wide Public Sector, Amazon Amazon Web Services
- Suman Sehra - Global Director, IOT Smart Cities & Intelligent Transportation, Intel
- Dr. Harsh Verma - Chairman, ACM Sacramento Chapter, Intel IOT Advisory Board Member
- Gabriel Youtsey - Chief Innovation Officer, UC Agriculture and Natural Resources

**Question 1: Introduce yourself**

**Américo Carvalho**
- Leads team that is group of AI specialists, composed of solutions architects, sales specialists, business development managers, and data scientists who work on teams to support their customer engagement
- Early adopter and saw AI early on. AI is something not new for Amazon; we’ve been using it over past two decades throughout products and services
- We use AI to spot trends in customers’ experiences.
- Logistics aspects has been mentioned in Amazon Robotics.
- One of goals is to make it easier for everyone to use AI machinery.

**Suman Sehra**
- My role in the company is focused on driving IOT data side, networks, and whole aspects of what technology can do for sectors of smart cities and intelligent transportation Looks modality of transportation; ITS, road infrastructure, road, marine, fleet management
- How technology is going to make transportation more efficient and resilient, especially in midst COVID. If you look at how COVID has impacted countries, there’s a lot of dependency on public transportation. Access to automobiles, different parts of the world, lack of trust in public transport being clean and safe. Offered us challenge and opportunity to deploy technology that would help alleviate and bring ridership level to a point that systems can sustain themselves.
- In India, Indian Rail Association is being forced to furlough their employees for next several months because they haven’t been able to keep up with expense and lack of revenue coming in.
- This is also challenging the business model has been set (Ex: Having autonomous vehicles/robots go in and spray disinfectant in trains). We look at questions like, how do these systems talk to one another? How do I ensure systems are actually going to operate in a manner as defined? People have concern with AI, lots of checks and balances in the system. Pushing solutions to the likes of IOT

**Dr. Harsh Verma**
- Looking to spin off Future Technologies Center
- As part of Intel IOT Advisory Board, looks into innovative projects to apply AI

**Gabriel Youtsey**
- Statewide entity, UC Office of the President groups, team of 150 working
- Our job is to interface with the UC campuses regarding food, agriculture, and environment
- My job is to think about how do we accelerate solutions to market through commercializing these technologies (ICT, biotechnologies, robotics, etc)
- We’re working to commercialize technologies (i.e, robotic, sensors, drones) to solve pressing problems; whether it be climate change problems, labor challenges, water challenges, pest and disease management
- Looking into demonstrating companies that’re advancing these solutions
- New AI Institute for Next Generation Food Systems, internationally-focused institute; first AI-centric food institute; will span a broad variety of food system (i.e, crop breeding, farming, food processing distribution, advanced nutrition technologies)
- Data-driven AI will power robotics, immediate on-farm decisions
- Work closely with industry to extend and improve these capabilities
- Utilizing Edge AI to identify a pests effectively
- Significant amount of funding for internships, focused on CC and four-year undergraduate students

**Question 2: What do you think of Ebony’s data, and how does that match to your own perspective on in-demand skills that CCs ought to focus on**
Américo Carvalho
- Data point regarding the rise in need for graphical user interface developers matches trend in our industry; we have underlying infrastructure to compute data; at a certain point, this has to get to the user for ability to build and design user-friendly interfaces; where we believe adoption of technologies can be accelerated as well
- Average wages for workers and geographies of it; pandemic has shown that we can do a decent job with remote and virtual work; roles that don’t require physical location; 90% of interactions are done remotely; will likely continue to do; recruiters won’t have to be constrained in particular areas
  - Can help with building more diverse workforce (Trish)

Suman Sehra
- When I look at work being done in industry, looking at skills that extend beyond those that can be easily retooled
- How can we enable partners to redo our educational system to allow for future growth
- When it comes to AI, there’s a whole subset of skills, one of them that is hard and laborious is annotation of the training datasets; we have to teach systems, quality of inference will be directly proportional to the quality of how well we train our model
- Those broken down into skill-level: those who understand the traffic industry well (i.e., how traffic flows,
- Down to AI piece, there’s a need for engineers with skills to annotate those data sets, engineers who use tools that would help in the democratization of AI, machine learning, and things of that nature
- Encourage professors who are in data science or AI to look at Intel’s OpenVino, made it easier for different levels of community (i.e., teachers, developers) to engage; we wanted AI part to not be limited for a few
- We also made Depth Cloud for developers to see what they are producing
- Instead of starting from scratch, we offer pre-existing/pre-trained models for different industries
  - Ex: food crop infestation; we’ve worked with big players in the Yuba region to implement
  - Looks at these players who are trying these models
- Gives you starting point to optimize for purposes of students looking to be trained or retrained for field

Dr. Harsh Verma
- For work-based learning, shorter learning modules help to learn and apply
- There’ll be a great demand for AI, Machine-learning, training in the cloud, new occupations will be there
- Helped 3,500 start-ups build up software with things like requirements, specifications; most important thing at the beginning is system architecture; building more into architecture development is needed
- Initially it looks complicated; how do we build convoluted neural networks? There are pre-trained models
- All companies, Amazon, Intel, Microsoft, Google, are creating tools for students and others to learn more easily
- One Professor ACM chapter and two student chapters; ACM Sacramento chapter has helped these student chapters with code-a-thons and has hired students from these groups
  - Opportunities for mentoring between students and professionals

Gabriel Youtsey
- Indicator of drop in computer programmers for software developers; “software developer” titling demonstrates rise in technical staff members with broader set of skills, who’s web-aware, cloud-aware, data-aware, and that they know how to interface with business users
- Software developers are doing technical integration and stitching together of solutions, and able to understand both business and technical language and do that translating
- There’s lagging indicator in the region, because it’s a government town; operational IT need is high vs new and growing sectors that require Silicon Valley-minded skill sets
- Have to hire someone in near future to help do work with companies like Iten, applying products in the food and agriculture sector; someone has to know about hardware, machines, IOT, networking, apps, and advanced data science; integrating technology skill sets with business applicability is what’s going to be critical
- Students having experience in integrative technology skill sets, having ability to stitch, is really critical

Question 3: What is your quick top thought on suggestions for CCs to prepare students for the industry?

Américo Carvalho
- Availability of computing power and single places to store, process, and transfer data which was achieved via Cloud storage services
- Any ability to be comfortable working with integration across different Cloud services and different technologies
- More focus is given to personality rather than technical experience itself
- Interviews are driven based on assessment on the education (?) with leadership principles in order to learn the personalities of candidates and see how they index in terms of customer obsession, ownership, ability to learn and be courteous
- The more broad and generalist a candidate can be, the better fit they can be to join companies like Amazon and grow inside those companies with the programs that are offered to develop talent.

Suman Sehra
- Industry and academia have to go hand in hand
Have a pragmatic approach with things like mentorship programs and information exchange programs; bring industry speakers as part of the curriculum so they can hear what kinds of challenges the industry is trying to solve. What are the tools and skills that are needed to be adopted or adapted? Create a talent pool and connect them with opportunities that local employers can tap into.

A better symbiosis between industry and academia must be created

Dr. Harsh Verma

- Building up closer cooperation with professionals in the industry with academia
- There could be opportunities for students to build up conceptual study papers, projects, posters, etc. as part of the ACM; encouraging students to come to poster sessions
- Students physically presented their posters and were able to interact with professionals
- Give students opportunities to work with professionals in an internship environment/program so they can work with industry members and get experience; gives them opportunities to be hired either through their internship or elsewhere

Gabriel Youtsey

- Independent free collaboration (?); ie. tech sector, food and agriculture, academic collaborations, etc
- Students need hands-on learning and experience for their careers, regardless of whether they’re ending their educational path with community college or continuing to get a PhD.
- Faculty should be able to talk to industries about their talent and research needs. Food and agriculture industry need to identify their challenges and test things; the tech sector needs to gain understanding of complex domains they aren’t experts in; help needs to be given to the startup sector because they’re the ones who will create new solutions and technologies that big companies may want to purchase.

Feedback on Previous Curriculum Actions (Markus Geissler, PhD)

Recent ICT Curriculum Changes in the Greater Sacramento (North) Region

ICT Programs Available in Greater Sacramento

- Computer Science (applied and transfer)
- Management Information Systems (transfer)
- Cybersecurity (applied and transfer)
- Information Technology (applied)
  - Cisco Networking Academy
  - Microsoft Imagine Academy
- Database Admin (applied)
  - Oracle Academy
- Web Development (applied)
- Office Applications (applied)
- (New) Data Analytics (CSUS College of Business)

American River College

- CIS: Microcomputer Applications - AS degree and certificate (2019)
- CIS: Database Management - AS degree and certificate (2019)
- Cybersecurity and Information Assurance - AS degree and certificate (2020)
- CIS: Mobile Programming certificate - Technical Communications AS

Cosumnes River College

- CIS: Information Technology - AS degree and certificate (2018)
- Cybersecurity - certificate (2019)
  - Online Collaborative with Fresno CC and LA Pierce/Mt. San Jacinto College
- Cybersecurity and Information Assurance - AS degree and certificate (2020); (formerly CIS: Information Systems Security)
- Management Information Systems - AS degree (2020)

Folsom Lake College

- Information Technology - AS degree (2019) and certificate (2020)

Lake Tahoe Community College

- IT Technician - Cybersecurity - AS degree and certificate (2019)

Sacramento City College

- Information Processing - AS degree (2021)
- Information Processing Technician - certificate (2019)
- Data Science - certificate (2020)
- Cybersecurity and Information Assurance - AS degree and certificate (2020)
PC Support - certificate (2019)
Web Developer - AS degree and certificate (2020)
Front-end Web Developer - certificate (2019)

Sierra College

IT: Cybersecurity - AS degree (2020)
IT: Network Technician - AS degree (2020)
IT: Data Analytics - AS degree (2020)
IT: Information Assurance and Cyber Defense - certificate (2020)
IT: Data Specialist - certificate (2019)

AI Initiatives in K-12 (Jared Amalong)
Providing updates on how we might bridge the gap from K-12 to community college to emerging job opportunities in AI. How can we close that gap? How can we get involved?

Five Big Ideas in AI

1. Perception - Computers perceive the world using sensors.
2. Representation and Reasoning - Agents maintain representation of the world and use them for reasoning.
3. Learning - Computers can learn from data.
4. Natural Interaction - Intelligent agents require many kinds of knowledge to interact naturally with humans.
5. Societal Impact - AI can impact society in both positive and negative ways.

(These ideas are explored further at [www.AI4K12.org](http://www.AI4K12.org))

Initiative: Our Mission
- Develop national guidelines for teaching AI in K-12
  - Modeled after the CSTA standards for computing education
  - Four grade bands: K-2, 3-5, 6-8, and 9-12
  - What should students know?
  - What should students be able to do?
- Develop a curated AI resource directory for K-12 teachers
- Foster a community of K-12 AI educators, researchers, and resource developers.

Three Tiers of AI4K12 in High School
- AI User - CSforAll... AI4All
  - Voice assistants, recommendations engines, facial recognition - we are all users of AI. Students may learn about the basic principles of AI technologies and the impacts of those technologies on society.
- AI Manager - APCP/APCSA
  - As students learn CS, they may create projects and applications that incorporate AI technologies. In our careers, many of us will “manage” AI too
- AI Developer - Capstone Experiences
  - Students develop and train AI models using industry tools and practices. This experience is likely accompanied with a 4+ year math pathway.

Teaching AI in 9-12: A Look Into The Future
- Expanded resources to integrate and teach modular AI units within existing courses
- Curriculum and Professional Learning Support for AI/Ml courses
- Post-secondary articulation and matriculation opportunities for students

- Join the mailing list
- Explore the resource directory
- Peruse curriculum and professional learning opportunities
- Provide feedback on the Big Idea #1 Guidelines

Breakout Sessions & Curriculum Review
1. Networking and Cybersecurity
2. Office Applications and Web
3. Programming and Database/Data Analytics
## Sacramento City College

<table>
<thead>
<tr>
<th>Title</th>
<th>Curriculum</th>
<th>Comments and Suggestions</th>
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<td>Cloud Computing</td>
<td>Certificate</td>
<td>19.5 is a good size for a certificate; Looks reasonable approach; is it vendor dependent? AWS will make it easy; Daniel and Lance gave a thumbs up; we want to see how it goes for Cosumnes River College; Encourage cloud</td>
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Overall: All breakout attendees approved curriculum
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Information and Communication Technologies:  
Artificial Intelligence and Data Analytics  
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Participant List

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<th>First Name</th>
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<td>Doug</td>
<td>Lewin</td>
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<td>Evren</td>
<td>Eryilmaz</td>
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<td>California State University Sacramento</td>
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ICT Regional Workforce Advisory Fall 2020
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<tr>
<th>Name</th>
<th>Title/Role</th>
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<td>Gabriel Youtsey</td>
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<td>UC Agriculture and Natural Resources</td>
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<td>Harsh Verma</td>
<td>Chair</td>
<td>ACM Sacramento Chapter</td>
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<td>Heidi Lyss</td>
<td>Consultant</td>
<td>Independent Consultant to Sierra College</td>
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<td>Jared Amalong</td>
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<td>Executive Director, Technology</td>
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<td>Jody Johnson</td>
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<td>Joelleen Takano-Alcantara</td>
<td>Computer Science Teacher</td>
<td>Twinrivers Unified School District</td>
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<td>Markus Geissler</td>
<td>Professor, Computer Information Science</td>
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<tr>
<td>Rudy Escobar</td>
<td>STEM Coordinator</td>
<td>Stanislaus County Office of Education</td>
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<tr>
<td>Sean Glantz</td>
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<tr>
<td>Sharon West</td>
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<tr>
<td>Suman Sehra</td>
<td>Global Director</td>
<td>Intel</td>
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<tr>
<td>Terri Carpenter</td>
<td>Workforce Development Manager</td>
<td>SETA</td>
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<tr>
<td>Tina Angell</td>
<td>CTE Teacher</td>
<td>Placer County Office of Education</td>
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<tr>
<td>Tom Cappelletti</td>
<td>Professor</td>
<td>Sacramento City College</td>
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<tr>
<td>Wendy Porter</td>
<td>ICT-DM RD Far North</td>
<td>CA Community Colleges</td>
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