

The background of the slide is a blurred image of a financial market data screen. It features various numerical values in green and red, some with upward and downward arrows, and a blue line graph. The text is overlaid on this background.

Designing the Future of Work: How to Build a Data Analytics Pathway to Fill High-Demand Jobs

Sinclair Community College, Dayton, OH

July 31, 2024

By Professor Paul Hansford, Associate Professor

Introduction

- Brief overview of the session's goals
- Importance of addressing the workforce skills gap in data literacy
- Introduction to Sinclair Community College's initiative



Overview

Designing the Future of Work: How to Build a Data Analytics Pathway to Fill High-Demand Jobs

- What have we been doing?
- Who are you and what is your interest today?

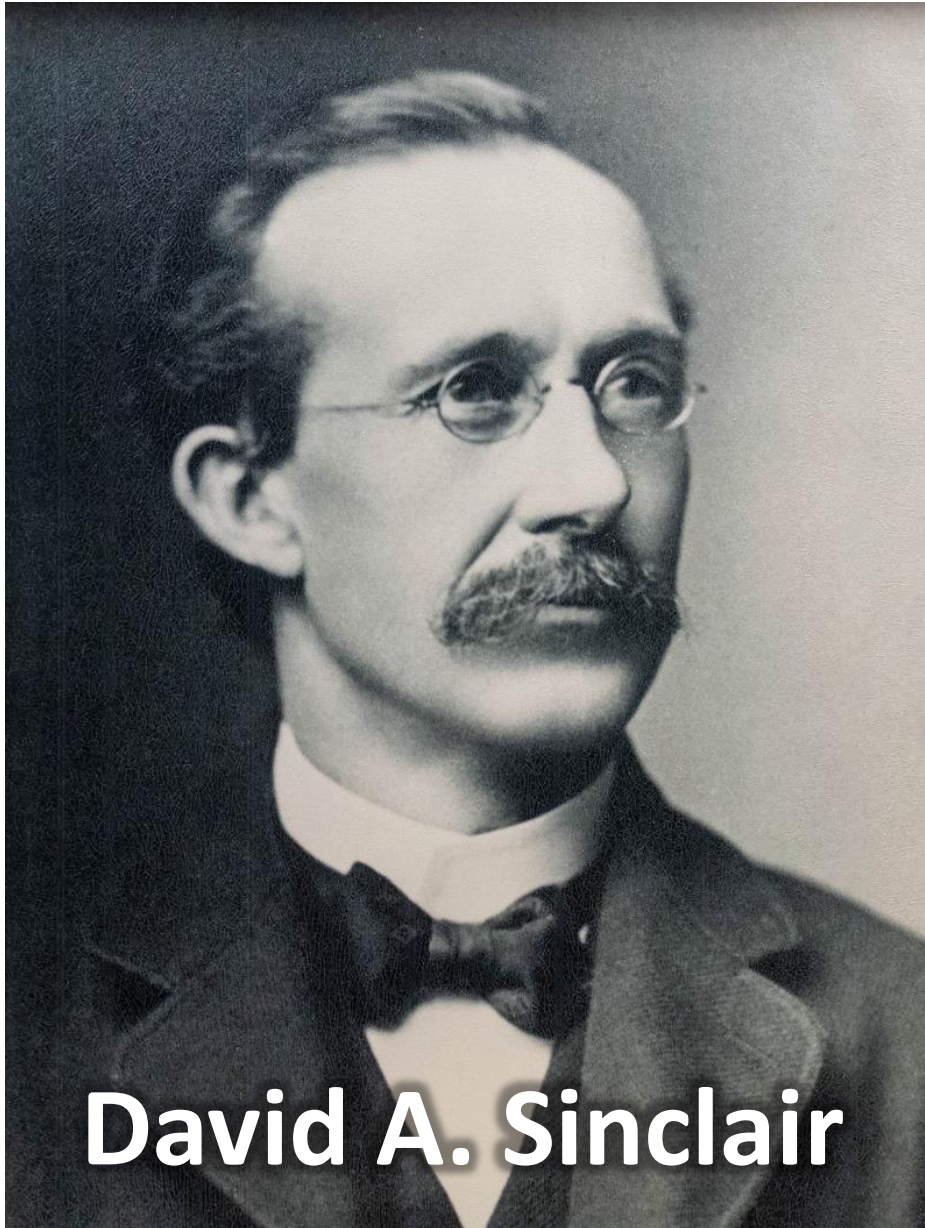
Survey



A scenic view of the Dayton skyline, Ohio, USA, featuring several tall buildings and a large glass-walled structure, reflected in a calm body of water. The sky is clear blue with light clouds. A green lawn and a small gazebo are visible in the foreground on the left.

About Dayton

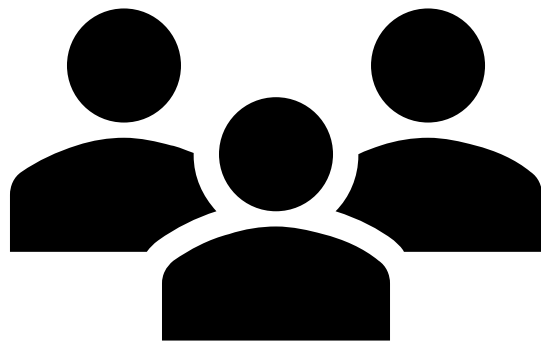
**It is always
sunny and
75 degrees
in Dayton,
Ohio, USA.**



David A. Sinclair

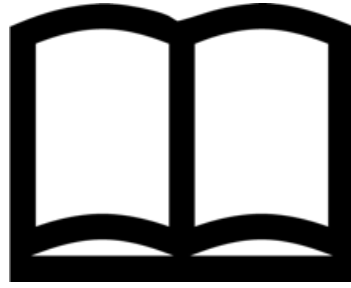
“Find the need and endeavor to meet it”

In 1887 Dayton YMCA General Secretary David Sinclair founded the courses of study that eventually became Sinclair College. Sinclair has always developed skilled citizens to succeed in jobs and life in this region.



31,000+

**Unduplicated college credit students
study at Sinclair annually**



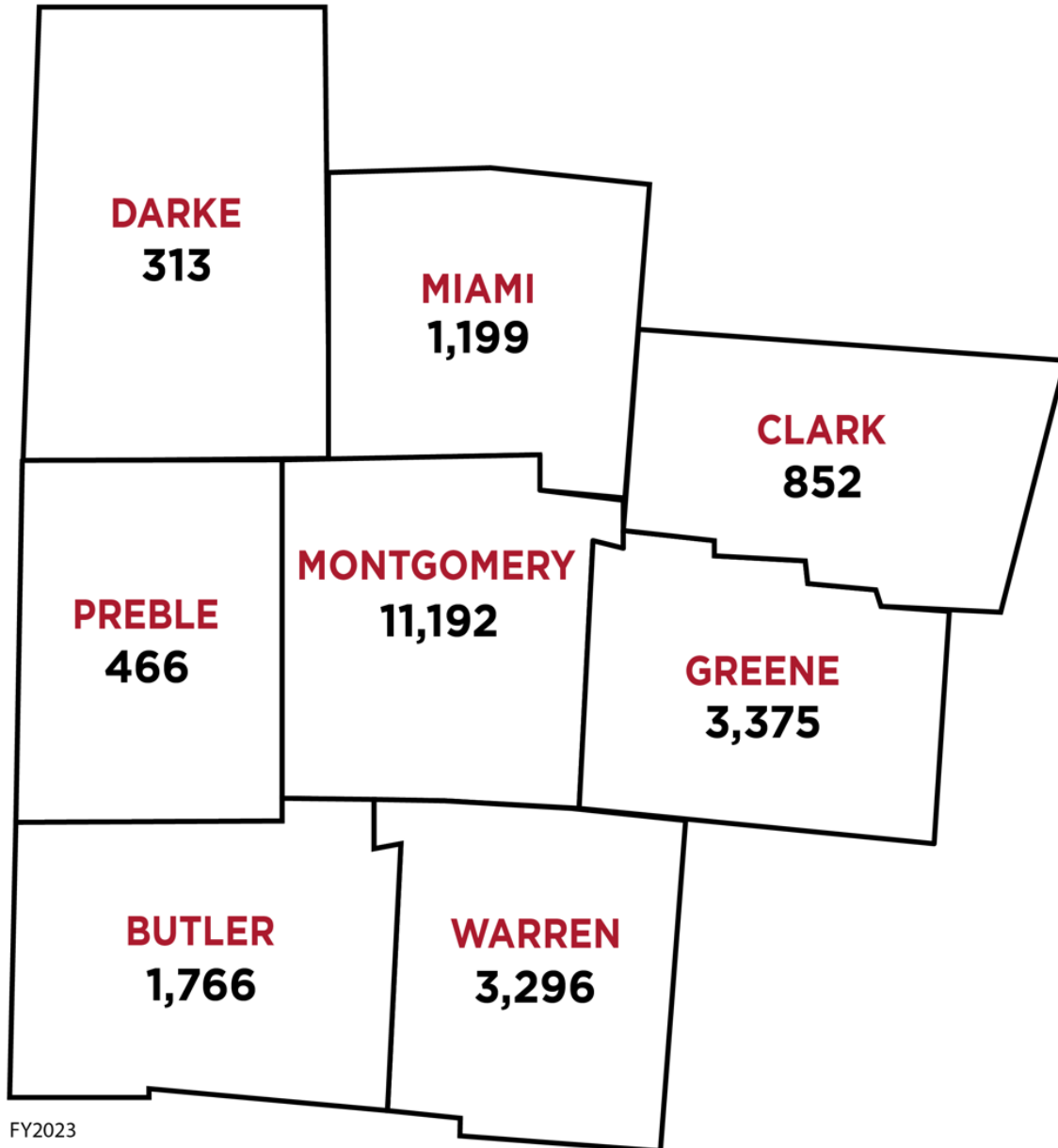
300+

Academic degree and certificate
programs offered by Sinclair

Sinclair College

Student Headcount Enrollment by County

(Unduplicated FY2023)



FY2023



90% of Sinclair Graduates
Remain in the Southwest Ohio region
to live and work after graduation

137 Years Later

Sinclair continues to identify needs and endeavor to meet them. As a result, Sinclair

- **Is one of the top community colleges in the world**
- **Serves nearly 30,000+ students a year**
- **Offers more than 300+ programs of study**
- **Has the lowest tuition in Ohio**
- **Is the region's largest workforce education provider**



Sinclair Community College

Centerville Location

**5800 Clys Road
Centerville, Ohio 45459**

**Beautiful building with IT and
Health degrees (certificates)**

<https://www.sinclair.edu/locations/centerville/>

Paul Hansford

Associate Professor Computer Science

- Professor Hansford bring to Sinclair 20+ years professional experience in information / business technology consulting
- Sinclair experience includes work on 5 NSF grants, teaching Database, Data Viz, Information Systems and Design, and leading data analytics programs
- Professor Hansford holds industry certifications Project +BI (Data Analytics) practitioner



About Family



- My wife and I have married 30 years in October.
- 4 Children – ages from 18 – 27 (3 girls and a boy).
- #1 Grand Kid born in December 25, 2021.
 - Now 2 and ½ years old

Addressing the workforce skills gap in data

- Growing Data
- Changing skills
- AI / GenAI
- People shortage

Designing the Future of Work: How to Build a Data Analytics Pathway to Fill High-Demand Jobs

Big IT Picture Today (Ohio)

- Major shifts and changes
- All Industries being impacted by AI/GenAI
- Big Companies coming to our area
 - Intel, Joby Aviation, Wright-Patterson Air Force Base growing, Honda
 - From convenience stores such as Buc-ees and Sheetz to shipping giants like Amazon, Dayton is becoming a hub for business.

“Crossroads of America” I-70 + I-75



Build the Pipeline/Pathway

- Plan recruitment according to business strategy
- Attract the right **talent**
- Find the right **talent**
- Assess **talent**
- Focus on developing your **talent**
- Monitor **talent** and outcomes and adjust accordingly



**The Landscape
Is Changing....**

Netflix Prize

Home Rules Leaderboard Register Update Submit Download

Leaderboard

Display top 40 leaders.

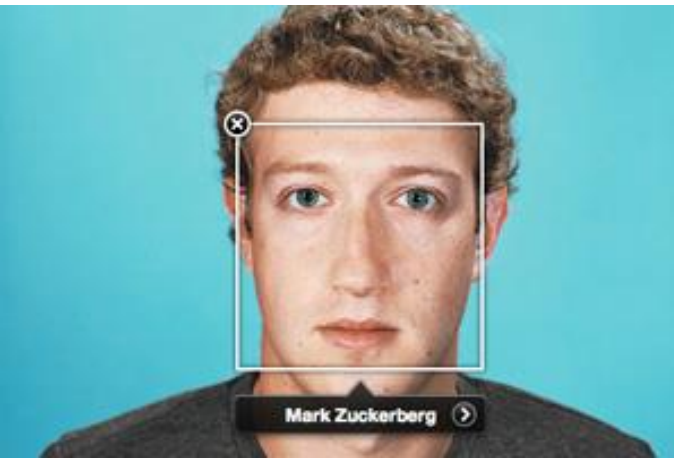
Rank	Team Name	Best Score	% Improvement	Last Submit Time
No Grand Prize candidates yet				
Grand Prize - RMSE <= 0.8563				
1	PragmaticTheory	0.8584	9.78	2009-06-16 01:04:47
2	Bellkor in BiaChaos	0.8590	9.71	2009-05-13 08:14:09
3	Grand Prize Team	0.8593	9.68	2009-06-12 08:20:24



Forbes
Kashmir Hill, Forbes Staff Welcome to The Not-So Private Parts where technology & privacy collide

TECH | 2/16/2012 @ 11:02AM | 1,441,868 views

How Target Figured Out A Teen Girl Was Pregnant Before Her Father Did



From the Magazine

ELON MUSK'S BILLION-DOLLAR CRUSADE TO STOP THE A.I. APOCALYPSE

Elon Musk is famous for his futuristic gambles, but Silicon Valley's latest rush to embrace artificial intelligence scares him. And he thinks you should be frightened too. Inside his efforts to influence the rapidly advancing field and its proponents, and to save humanity from machine-learning overlords.

BY MAUREEN DOWD
APRIL 2017



Modern policing: Algorithm helps NYPD spot crime patterns

By MICHAEL R. SISAK March 10, 2019

BRIEFING • ARTIFICIAL INTELLIGENCE

A.I. Expert Says Automation Could Replace 40% of Jobs in 15 Years

f t in e

Hi, how can I help?

UPMC Uses Machine Learning to Cut Lung Cancer False Positives

Using machine learning, researchers have significantly reduced the false positive rate for lung cancer diagnoses.

How Much Data is Generated Every Minute?



18M
Forecast
Requests



1K
Packages



176K
Calls



2M
Snaps



4M
Searches



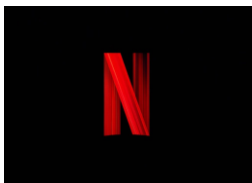
49K
User Posts



473K
Tweets



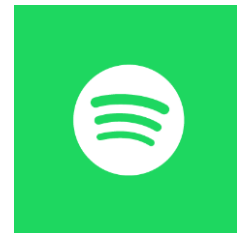
1K
Rides



97K
Hours
Streamed



15K
Songs
Downloaded



750K
Songs
Streamed



4M
Videos
Watched

The Skill Disruption Index by Occupation

Occupation	Skill Disruption Index
Data engineer	100
Data scientist	95
Web developer	94
Validation engineer	90
Network engineer/architect	88
Business intelligence architect/ developer	88
Database architect	88
Industrial designer	87
Software developer/engineer	86
Computer systems engineer/architect	83
Advertising/promotions manager	83
Computer programmer	83
Robotics engineer	83
UI/UX designer/developer	83
Mobile applications developer	82
Industrial-organizational psychologist	82
Database administrator	82
Financial quantitative analyst	82
Data/data mining analyst	81
Computer scientist	81
Webmaster/administrator	81
Data warehousing specialist	80
Printer/copier/scanner operator	79
Cyber/information security engineer/analyst	79

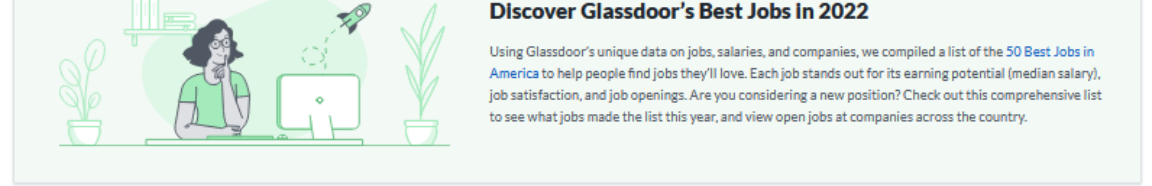
Changing Skills In Roles (2016 to 2021)

- Source: BCG-Shifting-Skills-Moving-Targets-and-Remaking-the-Workforce-May-2022

Future of the Roles

IT are top 50 roles from
Glassdoor

(Top 15 are mostly IT)



	Job Title	Median Base Salary	Job Satisfaction	Job Openings	
#1	Enterprise Architect	\$144,997	4.1/5	14,021	View Jobs
#2	Full Stack Engineer	\$101,794	4.3/5	11,252	View Jobs
#3	Data Scientist	\$120,000	4.1/5	10,071	View Jobs
#4	Devops Engineer	\$120,095	4.2/5	8,548	View Jobs
#5	Strategy Manager	\$140,000	4.2/5	6,977	View Jobs
#6	Machine Learning Engineer	\$130,489	4.3/5	6,801	View Jobs
#7	Data Engineer	\$113,960	4.0/5	11,821	View Jobs
#8	Software Engineer	\$116,638	3.9/5	64,155	View Jobs
#9	Java Developer	\$107,099	4.1/5	10,201	View Jobs
#10	Product Manager	\$125,317	4.0/5	17,725	View Jobs
#11	Back End Engineer	\$112,384	4.2/5	6,221	View Jobs
#12	Cloud Engineer	\$118,999	4.0/5	10,689	View Jobs
#13	HR Manager	\$91,502	4.3/5	7,276	View Jobs
#14	Business Development Manager	\$89,496	4.2/5	9,263	View Jobs
#15	Information Security Engineer	\$116,919	4.1/5	7,264	View Jobs

Source: https://www.glassdoor.com/List/Best-Jobs-in-America-LST_KQ0,20.htm

Top 10 Best Jobs in America for 2022

Rank	Job Title	Median Salary	Overall Rating	Active Job Openings
1	Enterprise Architect	\$144,997	4.1	14,021
2	Full Stack Engineer	\$101,794	4.3	11,252
3	Data Scientist	\$120,000	4.1	10,071
4	Dev Ops Engineer	\$120,095	4.2	8,548
5	Strategy Manager	\$140,000	4.2	6,977
6	Machine Learning Engineer	\$130,489	4.3	6,801
7	Data Engineer	\$113,960	4.0	11,821
8	Software Engineer	\$116,638	3.9	64,155
9	Java Developer	\$107,099	4.1	10,201
10	Product Manager	\$125,317	4.0	17,725

Check out the whole list of Glassdoor's [Best Jobs for 2022](#) in the U.S. and [Best Jobs for 2022](#) in the UK.

The Jobs Landscape in 2022

emerging
roles,
global
change
by 2022



Top 10 Emerging

1. Data Analysts and Scientists
2. AI and Machine Learning Specialists
3. General and Operations Managers
4. Software and Applications Developers and Analysts
5. Sales and Marketing Professionals
6. Big Data Specialists
7. Digital Transformation Specialists
8. New Technology Specialists
9. Organisational Development Specialists
10. Information Technology Services

declining
roles,
global
change
by 2022



Top 10 Declining

1. Data Entry Clerks
2. Accounting, Bookkeeping and Payroll Clerks
3. Administrative and Executive Secretaries
4. Assembly and Factory Workers
5. Client Information and Customer Service Workers
6. Business Services and Administration Managers
7. Accountants and Auditors
8. Material-Recording and Stock-Keeping Clerks
9. General and Operations Managers
10. Postal Service Clerks



Source: Future of Jobs Report 2018, World Economic Forum



36 Percent Growth

Employment of data scientists is projected to grow 36 percent from 2021 to 2031, much faster than the average for all occupations.

About 13,500 openings for data scientists are projected each year, on average, over the decade. Many of those openings are expected to result from the need to replace workers who transfer to different occupations or exit the labor force, such as to retire.

<https://www.bls.gov/ooh/math/data-scientists.htm>



Evolving Technology Landscape

Past

- US centric
- Hardware
- Analog
- Client/Server
- Data Reporting
- Products
- Human Interaction

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->

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->

->

->

Present

Global

Software

Digital

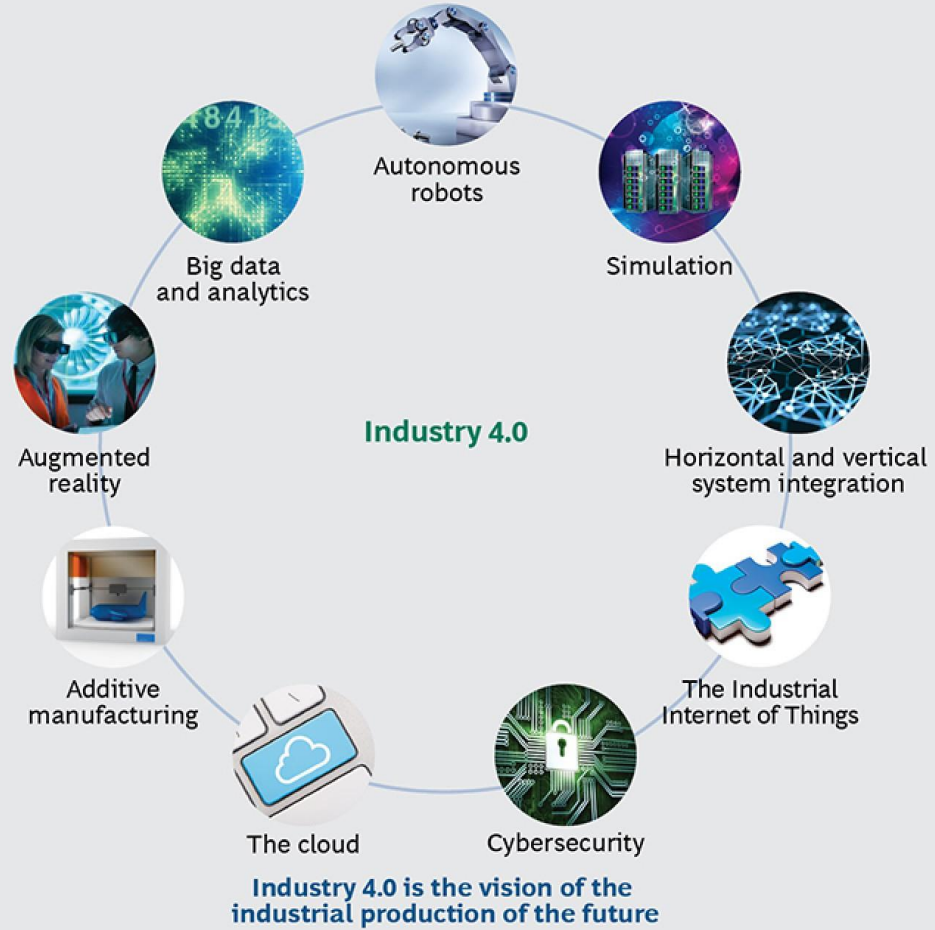
Cloud

Data Science

Solutions

AI/ML

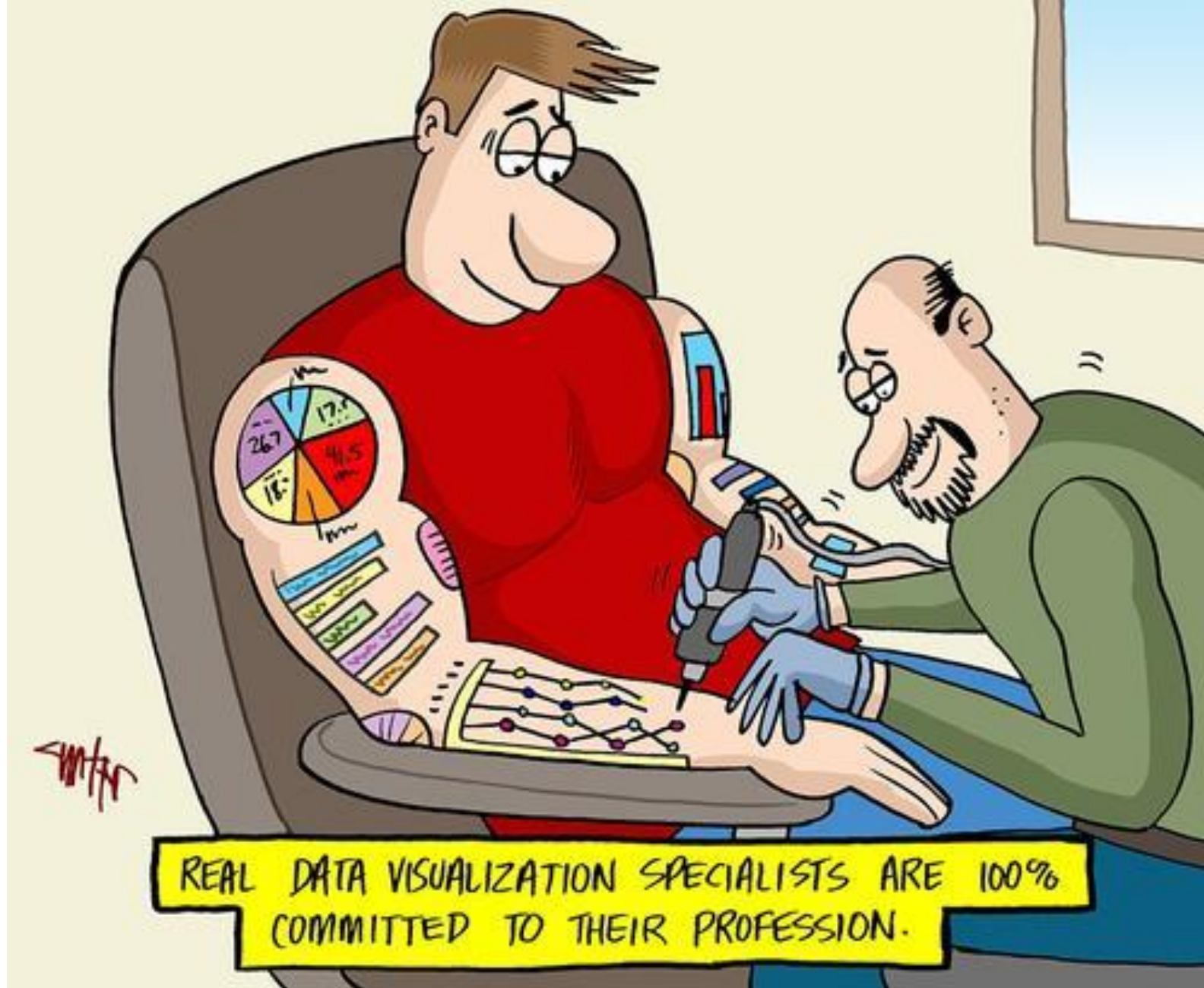
EXHIBIT 1 | Nine Technologies Are Transforming Industrial Production



Source: BCG.



Convergence of Tech



Several Grants

Survey #2



Data Analytics Timeline

- Initial One Year Certificate Program – 2010
 - Low enrollment, few completions
 - Significant math requirements (barrier to completion?)
- Started Career Pathways in Big Data NSF Grant – September 2015
 - Grant was initiated by Bob Sherman during the summer of 2015
 - Attended ATE Conference in Washington DC
 - Initial contact made with Big Data partner colleges and EDC
 - Panel Discussion of Burning Glass/BATEC study

Data Analytics Timeline Milestones

- One Year Certificate Program at Sinclair – 2010
- Creating Career Pathways in Big Data NSF Grant – October 2015
- DACUM Meeting to develop Profile of Big Data Specialist – April 2016
- Big Data Summit hosted by Sinclair – March 2017
- Completion of degree/course development in Data Analytics – Fall 2017
- ATE Conference Panel Discussion of Lessons Learned – October 2018

Data Analytics Timeline Milestones

- AAS degree approved by State of Ohio (ODHE) – March 16, 2018
- Stacked Credentials Meeting in Minnesota – May 2018
- Created Data Fundamentals short term certificate – October 2018
- Mentoring/Partnering with other Institutions in Hawaii – May 2019
- Developing degree promotional materials including TV spot, social media and brochures – Summer 2019
- Short Term Certificate goes live in Fall of 2019



mentoring

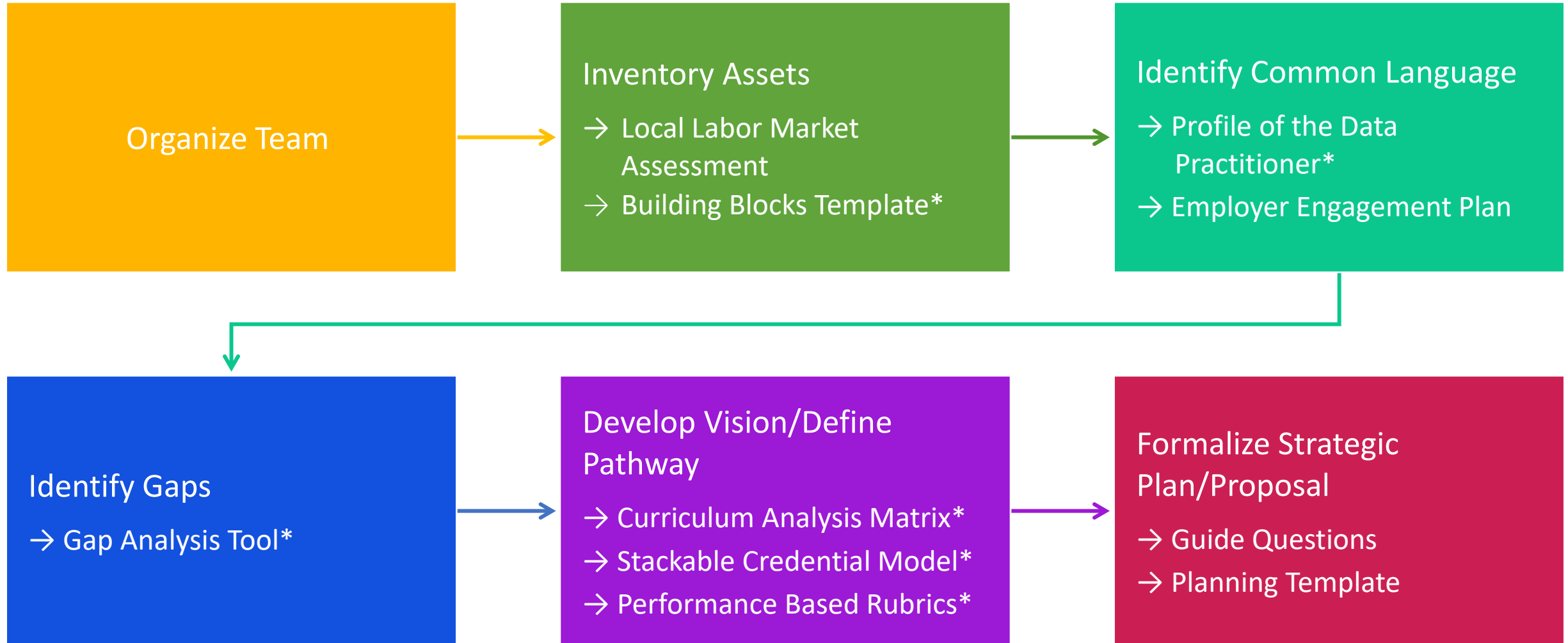
new

data

pathways

The text is arranged in four lines, with each word in a bold, italicized, blue sans-serif font. Each word is positioned between two horizontal lines, one light blue and one light green. Small circles are placed at the end of these lines, creating a sense of flow and connection between the words.

Data Pathway Development Process



Our process, tools etc documented

<https://amatyc.org/page/Webinars>

- Choose All Archived Webinars
- Scroll down:
- **Tools for Building Big Data Career Pathways at Community Colleges** by Joyce Malyn-Smith, Paul Hansford, Michael Harris, James Polzin, and Suzanne Smith
July 8, 2020 | [YouTube](#) | [PowerPoint](#)

Additional Resource

<https://amatyc.org/page/Webinars>

- Choose All Archived Webinars
- Scroll down:

Developing Data Science Programs at Two-Year Colleges by Crystal Wiggins, Kelly Fitzpatrick, Paul Hansford, Rachel Saidi, and Rebecca Wong
July 20, 2022 | [YouTube](#) | [PowerPoint](#)

Oceans of Data Institute's Data Pathways Projects



Creating Pathways for Big Data Careers

(DUE-1501927)

- Suzanne Smith, Johnson County CC, KS
- Michael Harris, Bunker Hill CC, MA
- James Polzin, Normandale CC, MN
- Paul Hansford, Sinclair CC, OH

Products:

- Profile of the Data Practitioner
- Tools for Building a Big Data Career Path

Mentoring New Data Pathways

(DUE-1902568)

- Michael Harris, Bunker Hill CC, MA
- James Polzin, Normandale CC, MN
- Paul Hansford, Sinclair CC, OH

Products:

- Data Pathway Development Process
- ODI Community of Practice

Funding from NSF's [Advanced Technological Education \(ATE\) Program](#)

First Grant Opportunity led to:

Led to a European Travel (I-STEM) to review Data programs in Belgium and France

Summer 2022

Conducted a study tour of European work-based learning programs focused on Data Analytics for faculty from several U.S. community colleges.

Grant Current (last 3 years)

- We noticed that we were attracting ‘nontraditional’ students
- We knew that ODE was working on changes
- We knew we wanted to work on the high school pipeline
- So, in the summer 2020 I worked with grants office

New Endeavor started July 2021

Build HS pathways for data analytics

1. **A new Data Literacy Foundations short-term postsecondary certificate** students can begin in high school to accelerate their completion of a Sinclair Data Analytics Associate degree
2. **Three new college-level courses** for both high school and college students aligned to Sinclair certificates and degrees
3. **Career awareness and academic modules for high school juniors and seniors** infused with experiential learning activities to increase interest in subject matter and data-related careers

New Endeavor started July 2021

Build HS pathways for data analytics

- 4. Data competitions for high school and college students** to incite interest in data careers and to teach the life cycle of data using real-world data sets supplied by industry partners
- 5. Annual high school teacher workshop** to provide high school instructors information about Big Data careers and academic pathways
- 6. New Service-Learning projects** for college students involving experiential learning at non-profit organizations
- 7. College student participation in professional conferences** offering opportunities to learn from and connect with professionals in the field

Next Steps

Survey #3



Degrees Summarized

Associate of Applied Science

Computer Information Systems/Network Engineering	→ +
Computer Information Systems/Secure System Administration	→ +
Computer Information Systems/Software Development	→ +
Computer Information Systems/User Support	→ +
Computer Information Systems/Web Development	→ +
Cyber Investigation Technology	→ +
Data Analytics	→ +

Associate of Science

Computer Science	→ +
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CIS is now an Independent department

- Back in the fall the split was made
- Data Programs fall into the Computer Science department

Data Programs Today

- **Data Analytics certificate** as of fall 2012
One-year Technical Certificate - 31 Credit Hours
 - <https://www.sinclair.edu/program/params/programCode/DA-S-CRT/>
- **Data Analytics Degree** as of fall 2018
Associate of Applied Science - 63 Credit Hours
 - <https://www.sinclair.edu/program/params/programCode/DATA-S-AAS/>
- **Data Fundamentals** as of fall 2019
Short-term Technical Certificate - 22 Credit Hours
 - <https://www.sinclair.edu/program/params/programCode/DF-S-STC/>
- **Data Literacy Foundation** as of Fall 2022 ****** really fresh**
Short-term Technical Certificate - 29 Credit Hours
 - <https://www.sinclair.edu/program/params/programCode/DL-S-STC/>

Collecting, analyzing, and reporting on data can drive conversations and priorities, and lead business decision-making. The data technician works in these data areas: Collecting and manipulating data, visualizing, and reporting data, applying basic statistical methods, and analyzing datasets throughout the entire data life cycle using tools like Python, SQL, R, Tableau, Excel, SAS, and more.

Data Literacy Foundations

Partner Course or ODE	HS Credits	Sinclair Course	College Credits	Mode of Delivery
Junior Year				
		CIS 1160: Intro to Data Literacy	3	Sinclair Tech Prep Proficiency ***new
		BIS 1120: Intro to Software Applications	3	Sinclair Tech Prep Proficiency
		CIS 2266: Python for Data Analytics	3	Sinclair Tech Prep Proficiency
		CIS 1130: Network Fundamentals**	3	CTAG
Senior Year				
		MAT 1455: Intro to Data Science or MAT 1460: Mathematics for Business Analysis	5/3	CCP
		BIS 1230: Spreadsheet Software*	3	CCP
Computer Coding & Web Apps 2		CIS 2165: Database Management	3	Sinclair Tech Prep Proficiency
Post High School: Sinclair Community College				
		CIS 2267: Advanced Python for Data Analytics	3	
		CIS 2265: Data Visualization with Tableau	3	
		CIS 2268 SQL Programming	3	

*Pending Updates **Pending Updates/Could be completed Junior or Senior Year

SCHOOL PARTNERSHIPS
COLLEGE CREDIT PLUS • TECH PREP
TRANSITION ADVISING



COLLEGE CREDIT PLUS
(937) 512-5188 | ccplus@sinclair.edu
www.sinclair.edu/college-credit-plus

SINCLAIR
COLLEGE

Data Programs Update

- Held fall 2023 meetings to align the certificates
 - Update course names
 - Add new courses to certs
 - Streamline certs to AAS

Recent Accomplishments

- Students & professional events, and experiential work in general. (DataFest)
- Gender Study with equal men and women in STEM (quite special I think 50/50)
- Finished up our Replication Guide
- Finished up another academic year 2023-24

Data Careers

Data professionals collect, analyze, and **transform data into actionable insights** that help organizations make decisions and grow.

Data roles are **essential in every career field**, including healthcare, finance, retail, technology, and more.

Students pursuing data education at all levels are encouraged to seek **internships** to build skills, experience, and a network that can **accelerate career growth and earning potential**.

High School

High school students can **earn dual credits** for many of Sinclair's data courses including:

- Intro to Data Literacy
- Intro to Software Applications
- Python for Data Analytics
- Intro to Data Science
- Mathematics for Business Analysis
- Spreadsheet Software
- Database Management

Get Started Early!

Part-time work & internships available.

Salary Range
Avg:
\$15-20/hour

Certificates

Data Fundamentals
23 credit hours

Data Literacy Foundation
32 credit hours

- These certificates are best for **traditional students** with no prior education or experience.

Data Analytics
33 credit hours

- This certificate is best for **nontraditional students** seeking to change careers or upskill and have prior education or experience.

Salary Range Avg:
\$17-25/hour

Associates

A.A.S. Data Analytics
65 credit hours

Students build skills in:

- Data Literacy
- Data Collection, Cleaning & Storage
- Programming
- Statistical Analysis
- Database Design & Management
- Visualization, Communication & Storytelling

All three certificates are embedded in the associate's degree.

Salary Range Avg:
\$30-45/hour

Bachelors

B.S. Data Analytics
Western Governors University
*official agreement exists

B.S. Analytics - Applied Data Science
Franklin University
*official agreement in progress

Other official transfer agreements are in progress.

Former students have transferred to schools like Wittenberg, NC State Chapel Hill, Purdue, and Columbia.

Salary Range Avg:
\$40/hour+

Year
1

AY 2021 - 2022



Courses
and
Pathways

- Created **dual enrollment** pathway for high schools and **piloted Python** course
- Developed 3 **new courses** and updated Data Visualization



Professional
Development

- Hosted **summer workshop for high school educators** and equipped them with data skills and knowledge



Events,
Activities
&
Projects

- Drafted **academic modules** for high school teachers to use in their classrooms
- Drafted a **career module** for high school teachers



Marketing,
Outreach &
Dissemination

- Hired a crew to begin filming a **"Data in Action" video series** showcasing data careers at local organizations

Year
2

AY 2022 - 2023

- Piloted new **Data Literacy course** with high schools
- Piloted new **Advanced Python** course at Sinclair

- Hosted **summer STEM workshops** for high school educators and students
- Sponsored college students to **attend conferences**

- **Completed academic modules** for high school teachers and students
- Hosted Sinclair's first ASA **DataFest competition**

- **Completed production** on five "Data in Action" videos with regional partners in the public and private sector

Year
3

AY 2023 - 2024

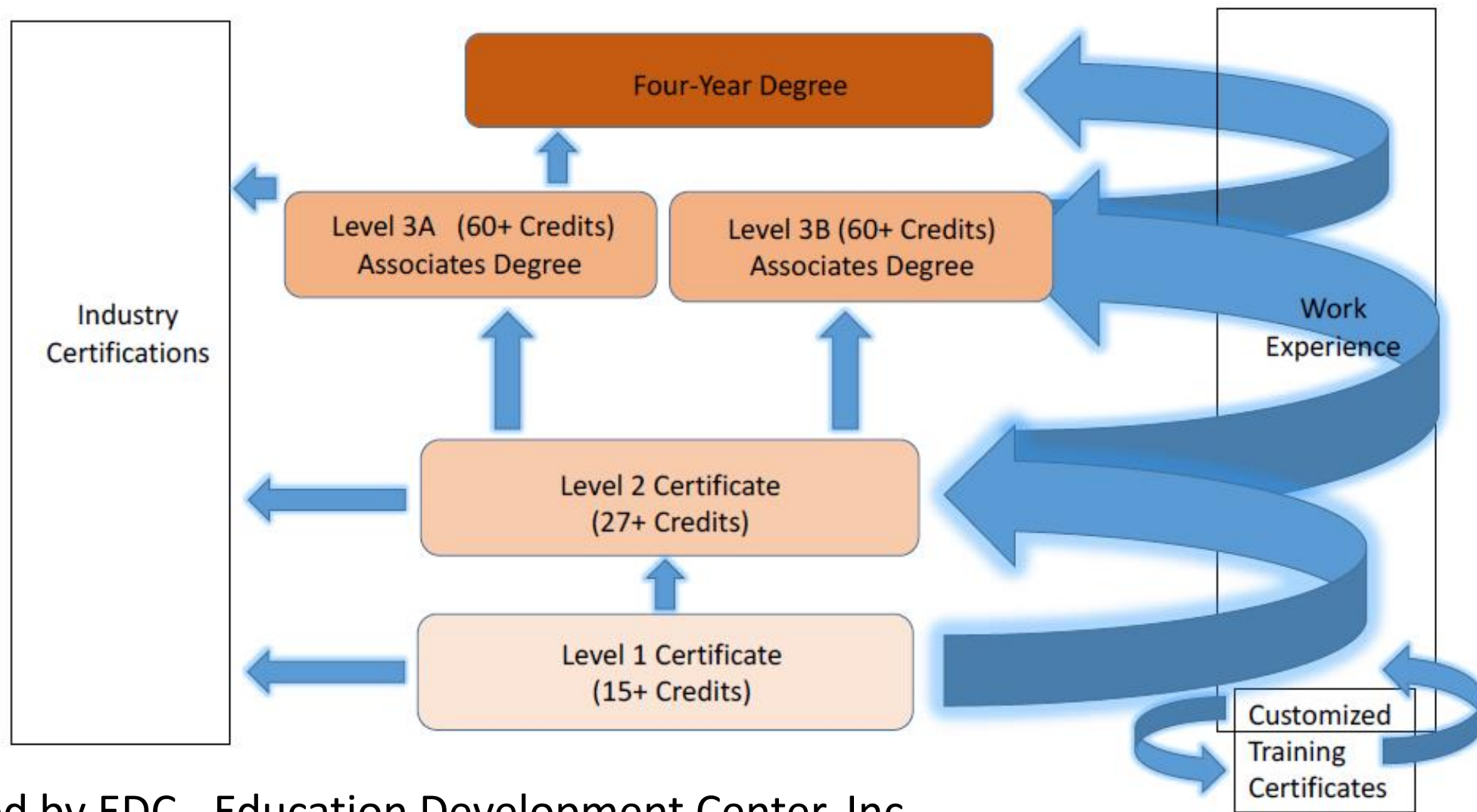
- **Piloted** Intro to Data Literacy and Intro to Data Science courses with **college students**
- **Began rewrite** for Database Management course

- Hosted **data workshop** for high school educators
- **Sponsored college students** to attend conferences, workshops, and hiring events

- Hosted ASA DataFest
- Completed a **Gender Study**
- Developed "Exploring Data" modules for **high school teachers and students**

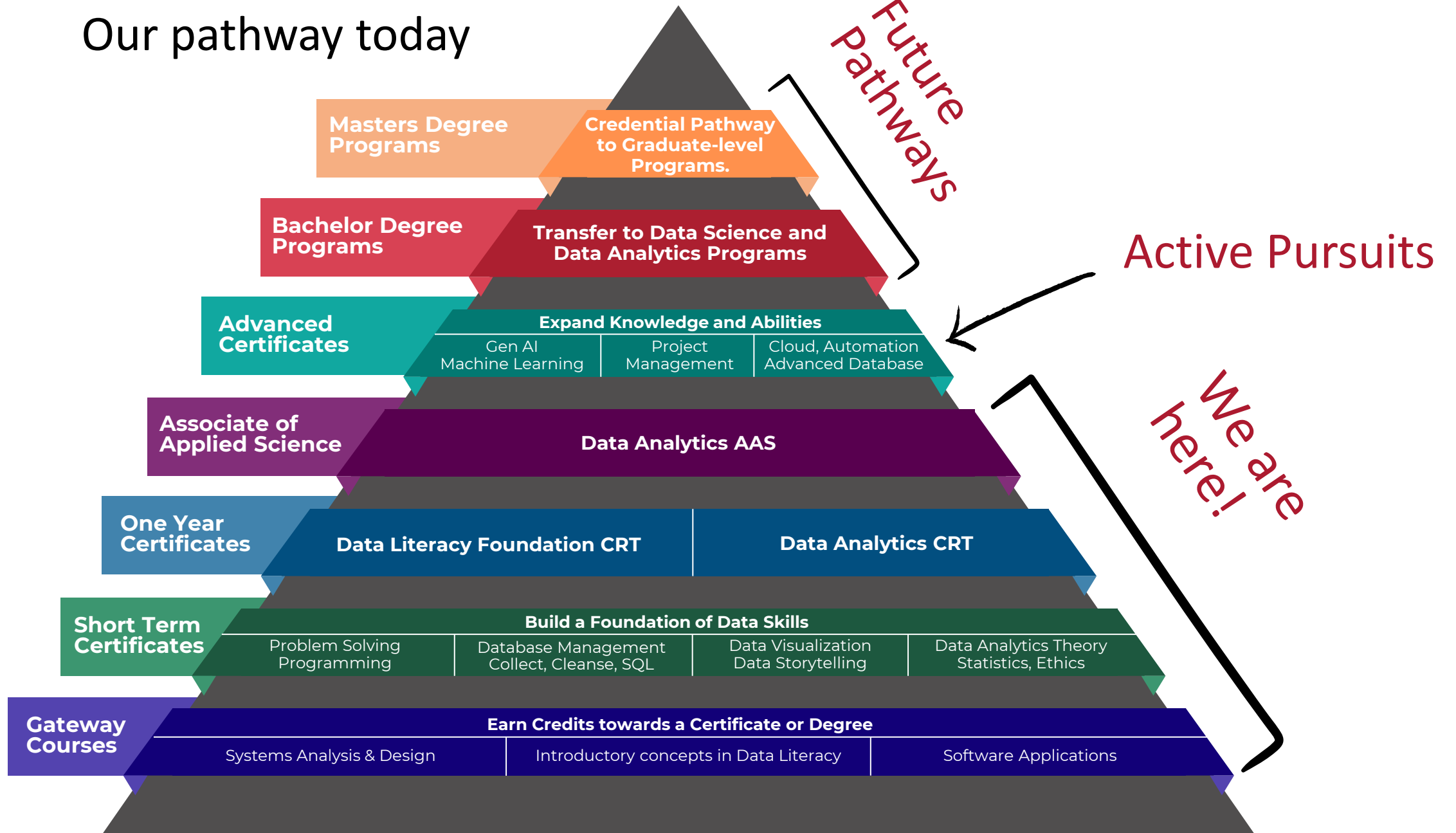
- Produced a **DataFest video**
- Created a **Replication Guide**
- Professor Hansford **selected to present** at Hi-Tec 2024

Stackable Credentials Model for Data Science and Analytics (Data Practitioner)



Created by EDC - Education Development Center, Inc.
NSF Grant #1501927 "Creating Pathways for Big Data Careers"

Our pathway today



My goals (my data programs)

- Industry lead (working social partnerships – BILT)
- Data-Driven (EMSI, burning glass - Lightcast)
- High Quality Instruction - QM
- Multiple Modalities (F2F, online, hybrid, CBE, Hyflex, Remote Ins)
- Service and project bases learning (CRUSH)
- Certs to gain (aligned) - Data +, Google, Tableau Data Analyst
- Articulated to next degrees - advanced cert, 4 year
- Workforce Ready (internship, apprentices, part time role)

Skills for the “data” future

- Advanced Excel (Spreadsheets) SQL
- Database / SQL
- Data Visualization (Tableau)
- Programming in Python/R
- SAS / Knime / Alteryx
- Statistics
- Business skills aka Domain Specific Knowledge
- Problem Solving with Data; Ethical; Communication and prioritization with PBL and internships

Next Grant Plans

- Build a 'Data 4 Good' Practicum
- Create more articulations
- Build Advanced Certificate
- Continue Experiential Learning
 - Events, conferences, and competitions

Key Takeaways

- Data is everywhere and growing.
- Data skills are in high demand and high growth.
 - Literacy, analytics, engineering and science
- Data decision-making is changing so we must adapt.
- It is good time to act!

Contact Me

Paul Hansford, MS.

Associate Professor

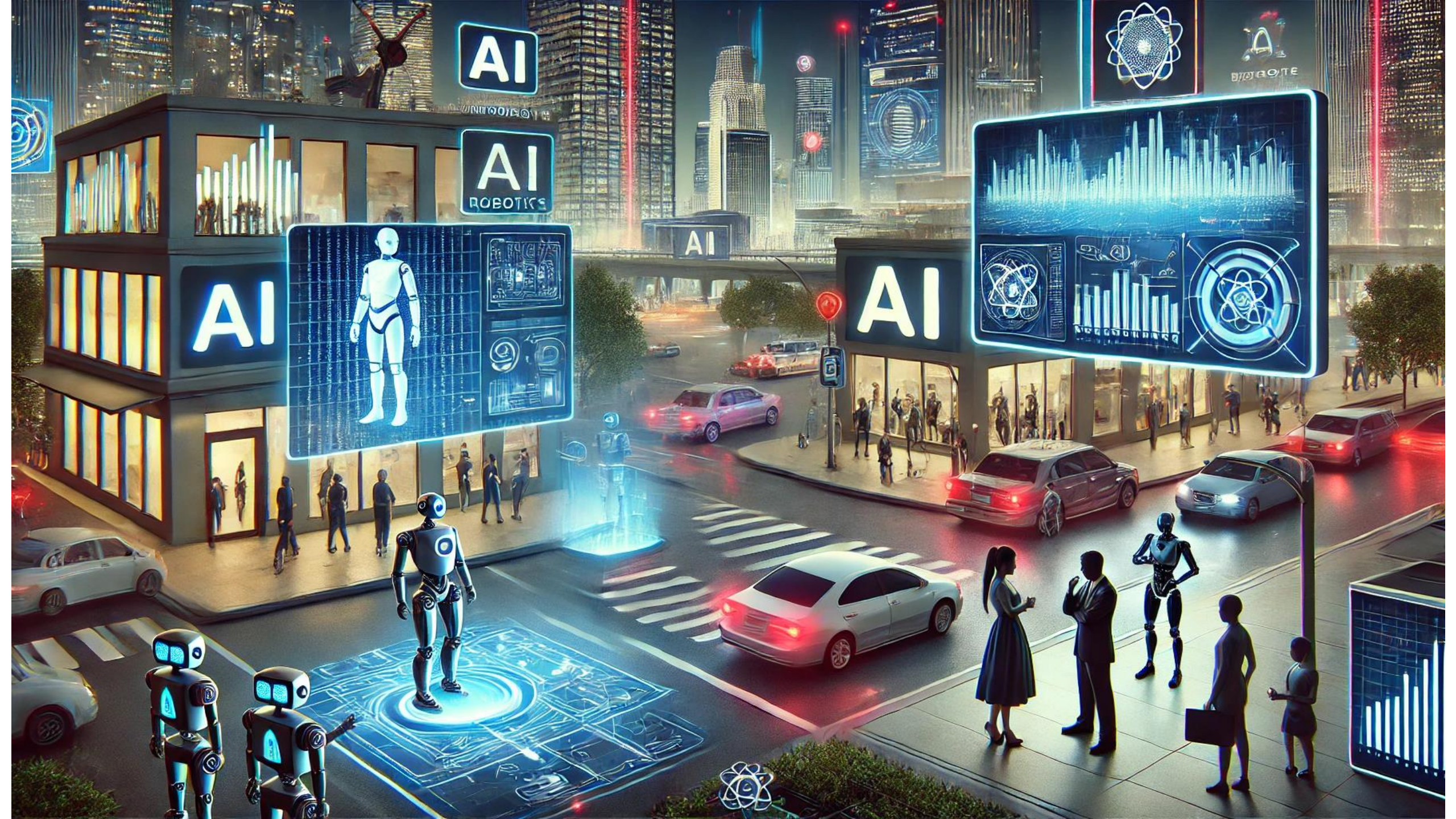
E-mail: paul.hansford@sinclair.edu

Voice: (937) 802-0496 (google voice)

Web: www.sinclair.edu

<https://www.sinclair.edu/program/params/programCode/DF-S-STC/>

#BeDataLit



AI

AI
ROBOTICS

AI

AI

AI

AI



Thank You!



SINCLAIR
COMMUNITY COLLEGE

