

2025 STEM Industry Needs Assessment for CT

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SCSU Innovation Hub

- **Purpose:** Foster Innovations that Optimize Student Success
- **Drivers:** understand industry needs and help students meet those needs
- **Actions**
 - **Building Capacity** by helping align academic programs based on industry needs from Middle – Graduate school
 - **Advancing Community** awareness and access to opportunities in STEM and Emerging Tech
 - **Facilitating Opportunities** in research and innovation, including experiential learning programs for students and educators
 - **Individualized Consulting** for students, schools, community colleges and universities in CT
- **Highlight of Impacts (since 2020)**
 - 75+ use-inspired research projects
 - 200+ jobs/internships for students + recent grads at 50+ STEM companies
 - Supported development and launch of Early College program for New Haven HS students, BioCity
 - Numerous degree programs, certificates and courses have been developed in response to our needs assessments – more are anticipated in the coming years

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Challenges and Goals

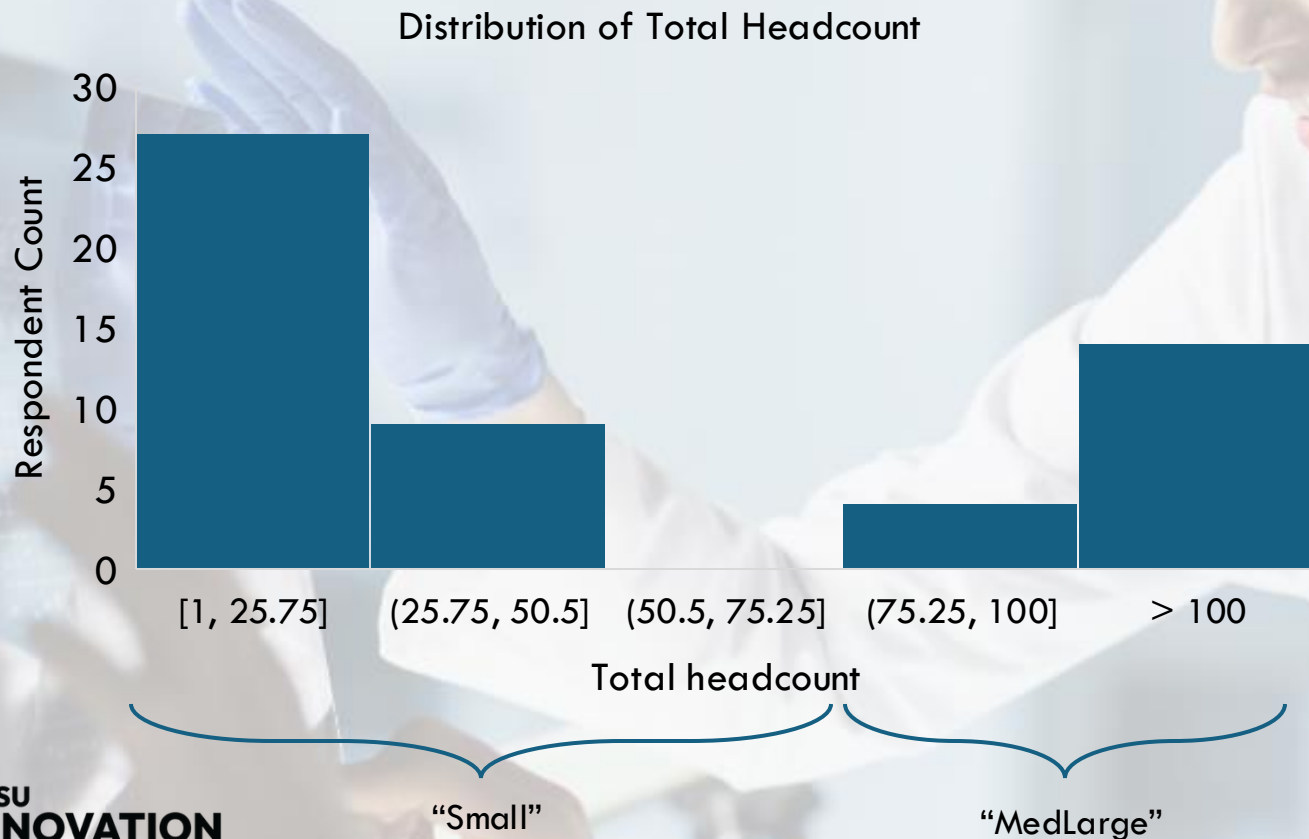
- **Challenges: what we know** *(from our '15 and '20 Needs Assessments and our teams' efforts to help students earn positions)*
 - STEM companies prefer entry-level candidates who possess
 - Degree
 - Skill set well-matched with their needs AND
 - Experiential learning beyond traditional lecture and laboratory training
 - Students and recent grads who do not meet those criteria rarely get interviewed
 - Population challenges include changing work-life priorities and population decline among Millennials and Gen Z; the manufacturing sector has been especially impacted ([ref 1](#), [ref 2](#), [ref 3](#))
- **Goals for the 2025 INA include identifying:**
 - Education levels companies are seeking for STEM opportunities AND
 - Skills and attributes, and programs that align with current and projected hiring needs
 - Share our findings to promote conversations and spark advances in teaching & learning

Methods

- Expanded focus beyond our 2015 & 2020 Needs Assessments to include:
 - Biology, Biotechnology, and Biochemistry AND
 - Physics
 - Chemistry
 - Data science and computer science
 - Emerging technologies
- Over 50 questions, with several “general” that then bifurcate based on the above disciplines
- Distribution
 - Social media posts and emails to industry contracts
 - Further supported by the Connecticut State College and University System, AdvanceCT, and BioCT

Response composition and sector rollup

- 54 respondents from 54 companies between August – October 2024
- Total employee headcount and industry sector information provided by AdvanceCT (used for percent calculations)
- Companies were aggregated into 3 major sectors: Biopharma, Industrial, and Info/Fintech
- In what follows, we break out response patterns by these major sectors *when helpful*



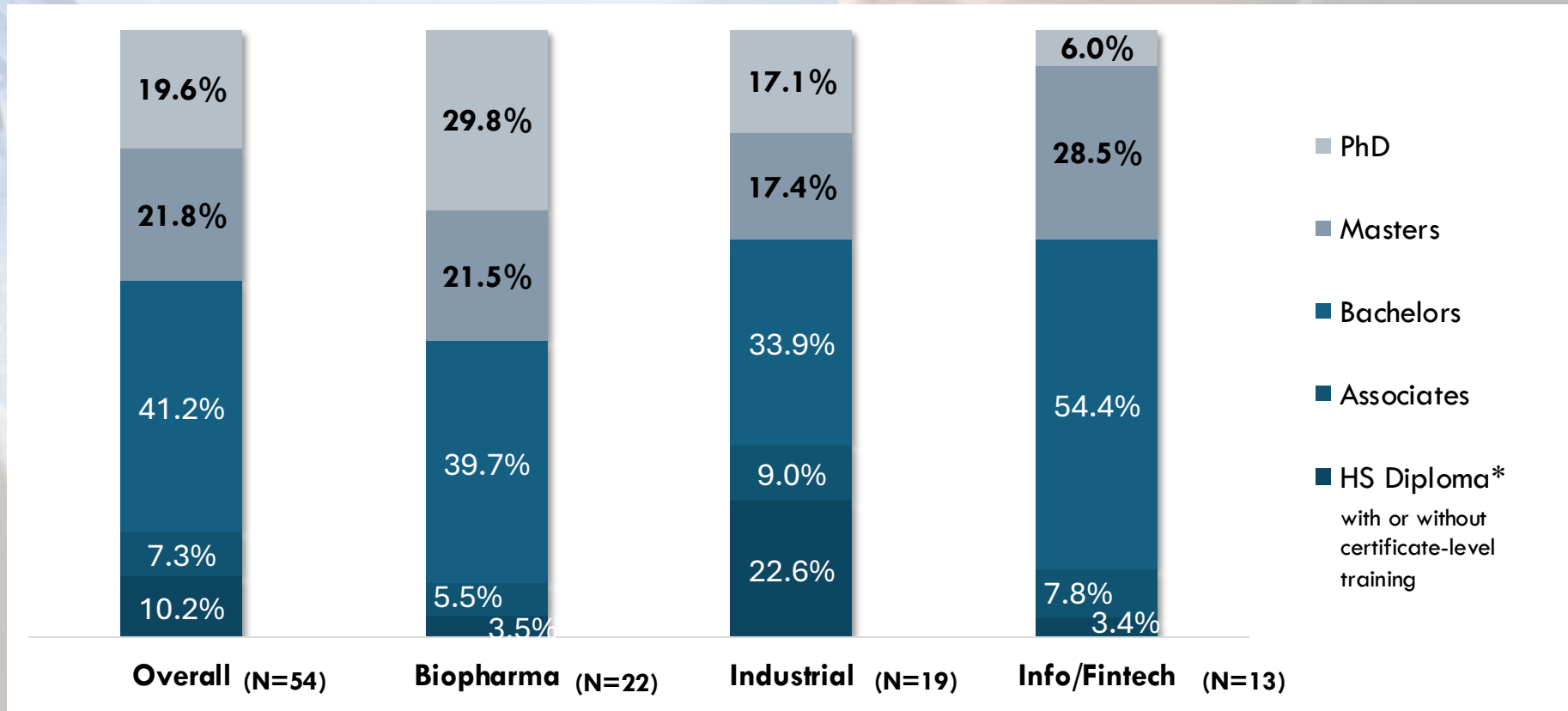
Biopharma (N=22)	Pharmaceuticals & Biotechnology (18)
	Testing Labs (2)
	Medical Device Manufacturers (2)
Industrial (N=19)	Food & Beverage (1)
	Advanced Manufacturing (14)
	Energy/Utilities (1)
	Renewable Energy (3)
Info/Fintech (N=13)	State & Local Gov. (2)
	Technology (6)
	Insurance (2)
	Venture Capital (1)
	Consultant (2)

Terminal Degree Share by Sector

Percentages reflect respondents share of total workforce in CT (not just entry level) by sector

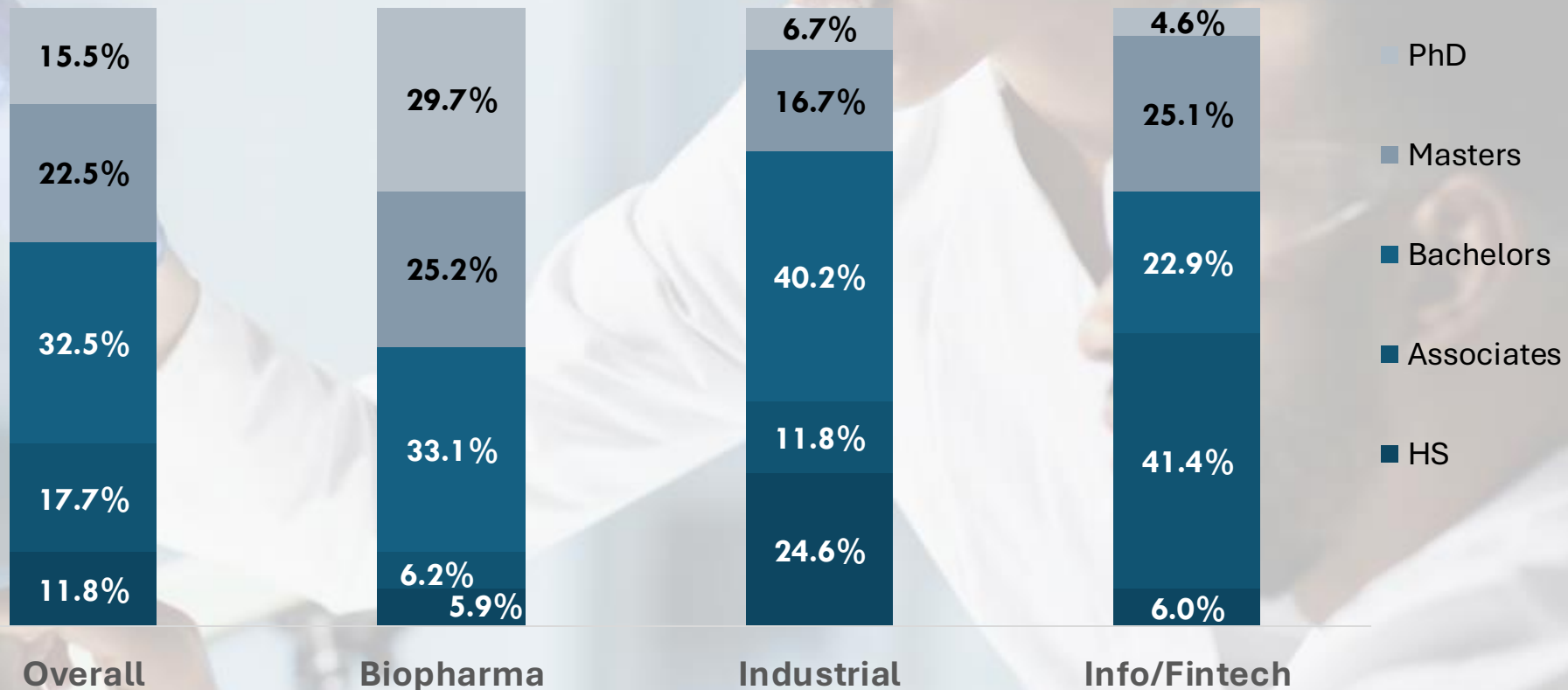
Major differences between the sectors:

- Info/Fintech: BS holders make up over half the workforce at Info/Fintech companies
- Biopharma: few workers do not have BS or higher (9.5% and 10.2%, respectively), highest demand for PhDs
- Industrial: much larger share of workers hired without a degree beyond HS and lower rates of MS holders



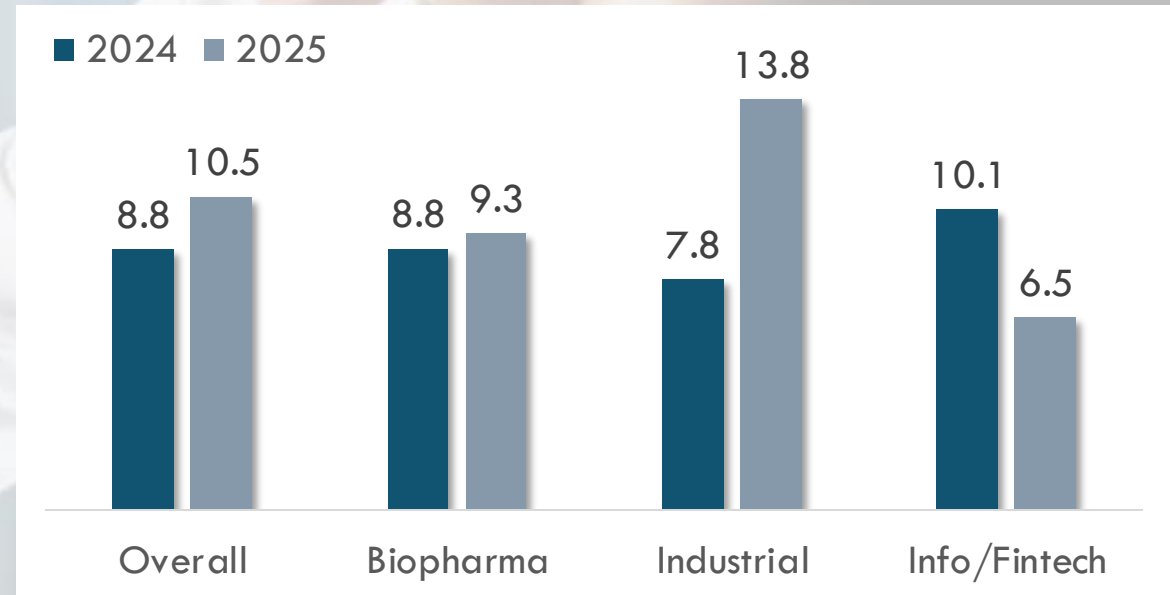
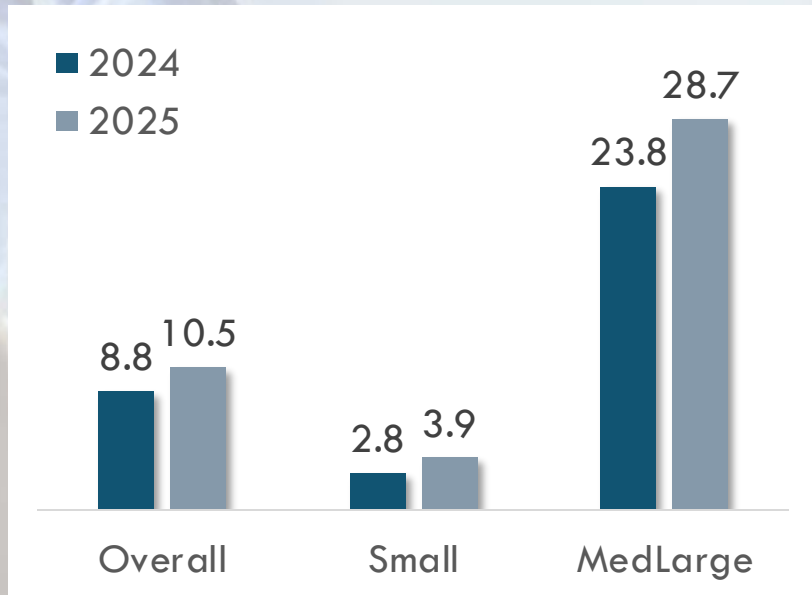
Hiring Profiles next 2-5 years by terminal degree and major sector

- Hiring projections at Biopharma and Industrial companies closely mirror current workforce
- One exception is that Industrial companies plan to hire only 6.7% of workers with PhDs, though PhDs make up over 17% of their current workforce.
- Info/Fintech companies report a far higher interest for Associates degree holders (41.4% of future hiring) compared to current workers (7.8% hold Associates degrees)



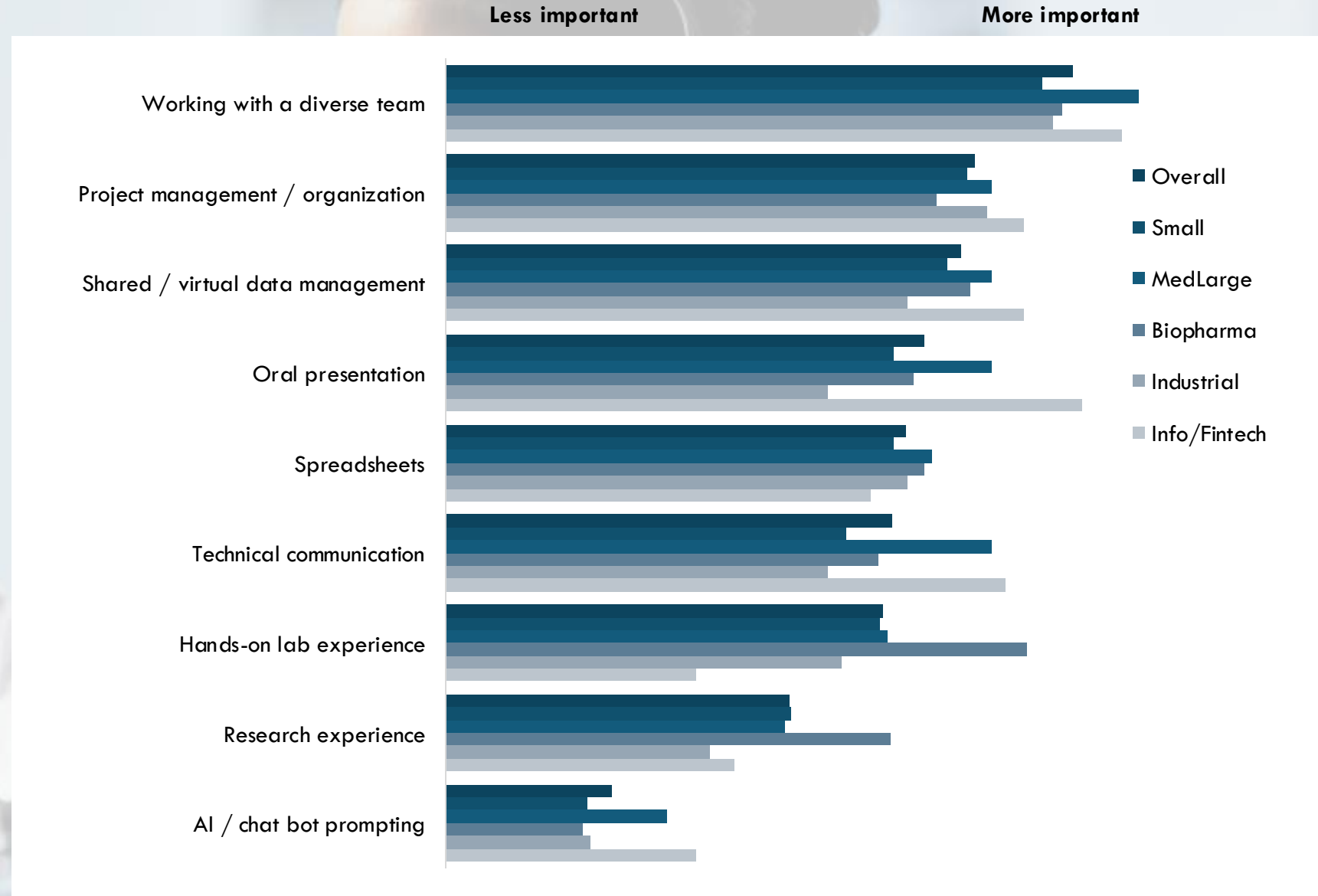
CT Hiring plans 2024 and 2025 by company size and major sector

- Average of 8.8 employees hired in '24 compared to an average projection of 10.5 entry level hires in '25 (20.3% projected increase in entry level hiring)
- Small companies (<100 headcount, N=30) expect to grow headcount significantly faster on a percentage (but not absolute) basis than do medium and large companies (N=12) – *typical in CT (US SBA, 2023)*
- Sector comparison:
 - Industrial companies are projecting higher hiring rates than Biopharma and Info/Fintech companies
 - *Recent actions of the federal gov't are not accounted for in this data*



How important is it for entry-level hires to be proficient in the following skills?

- Companies value working with a diverse team highest among general skills
- MedLarge companies also value oral presentation and technical communication
- Hands-on lab and research exp highly valued in Biopharma – not as valued in Industrial and Info/Fintech
- AI / chat-bot experiences are not valued highly relative to other skills for entry level workers



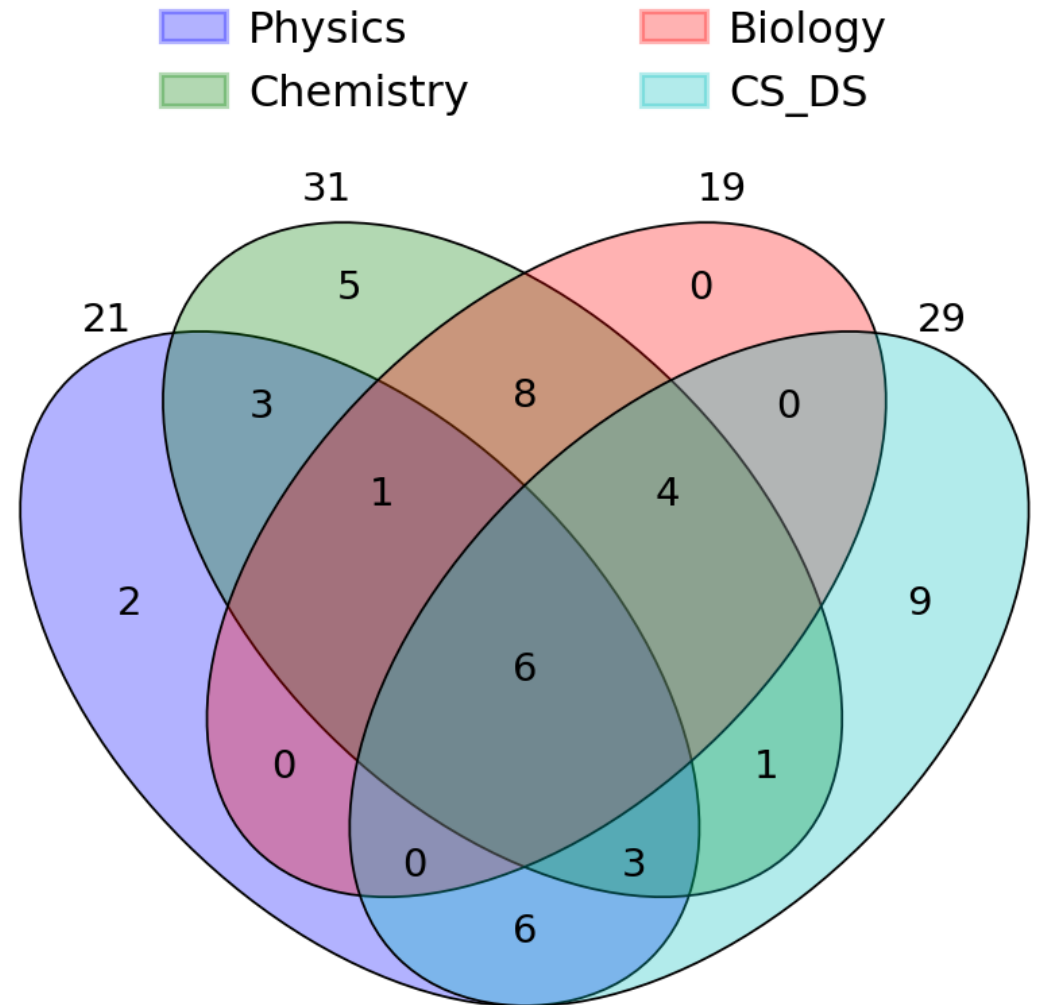
STEM Area Self-Classification *54 companies surveyed*

Category Totals

- 21 identified Physics as relevant to their operations
- 31 for Chemistry
- 19 for Biology and Biotechnology,
- 29 for Computer Science / Data Science (CS/DS)

All respondents were asked about Emerging Tech

- Diagram shows overlap between categories responses were not mutually exclusive; 16 possible discipline profiles
- Biology displayed the least independence; no companies selecting Biology as relevant without also selecting Chemistry
 - *Suggestion – Biology should be paired w/ other disciplines (already standard)*
- CS/DS displayed the most independence, with 9/29 companies not selecting any other discipline

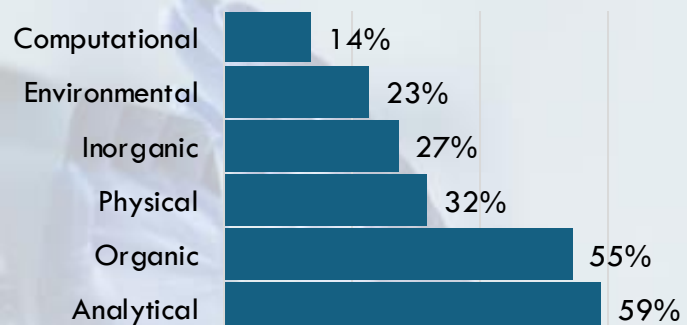


Discipline skills focus: Chemistry

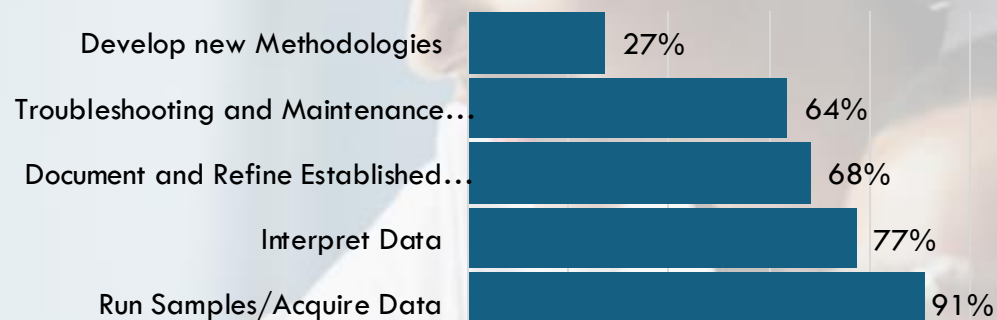
22 responses; 15 small, 7 MedLarge

- High diversity regarding relevant domains; most popular (Analytical) was identified by 13/22 respondents
- Computational chemistry was identified by 3/22
- Respondents were nearly unanimous in prioritizing the ability of entry-level hires to run samples and acquire data (20/22)

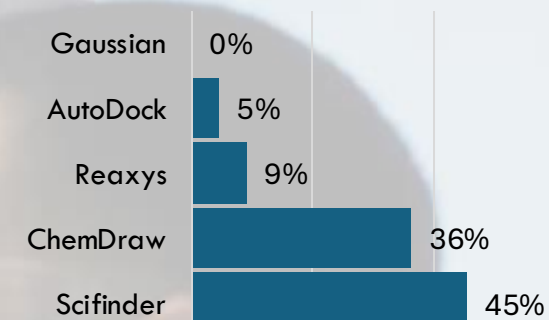
Sub-disciplines



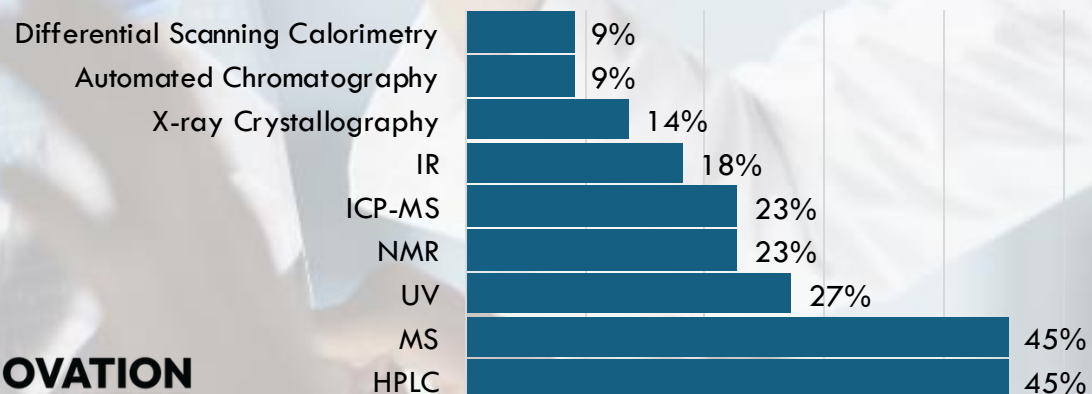
General Techniques



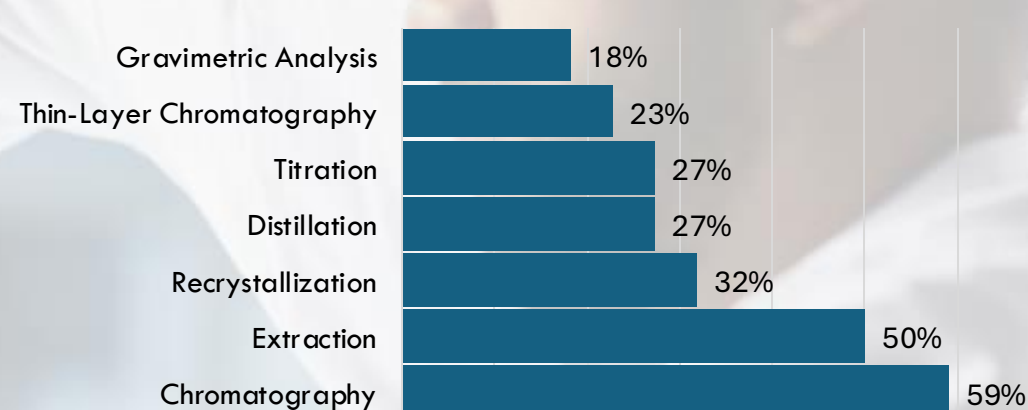
Software Packages



Instrumentation



Lab Techniques

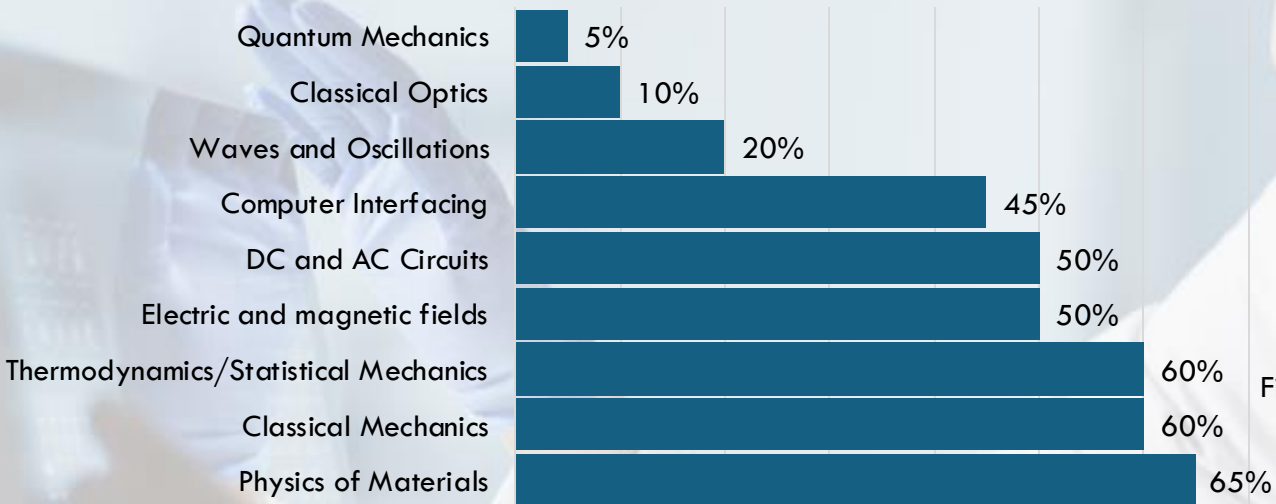


Discipline skills focus: Physics

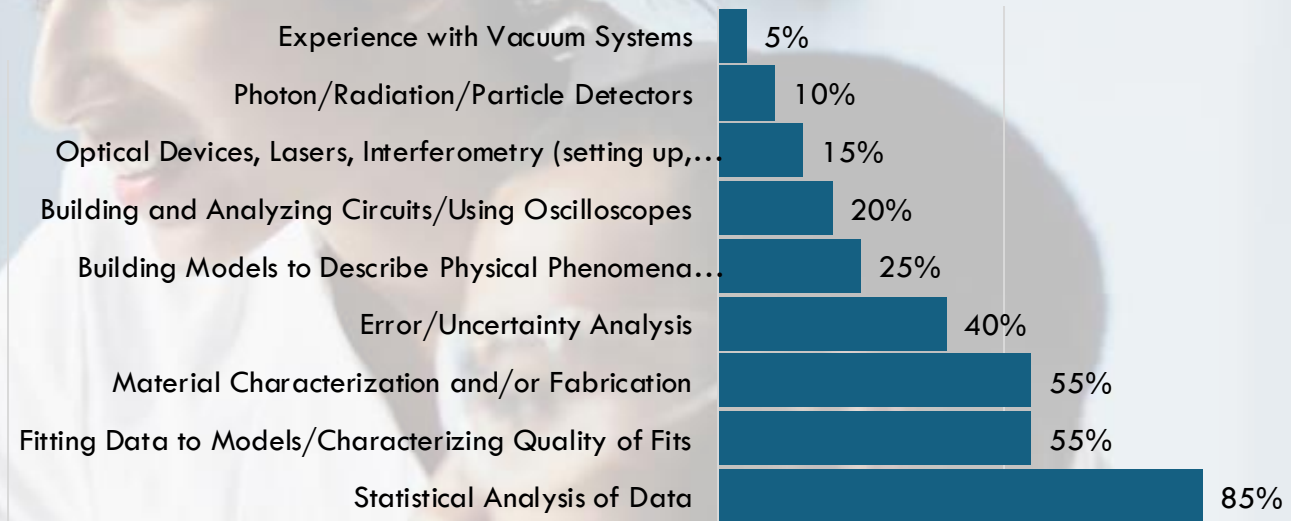
21 respondents; 16 small, 5 MedLarge

- Subdisciplines (most valued): Physics of Materials, Classical Mechanics, Thermo and Statistical Mechanics
- Experimental Techniques: Statistical Analysis of Data, Fitting Data to Models, Material Characterization
- Computations and Model Experience: Python and Matlab

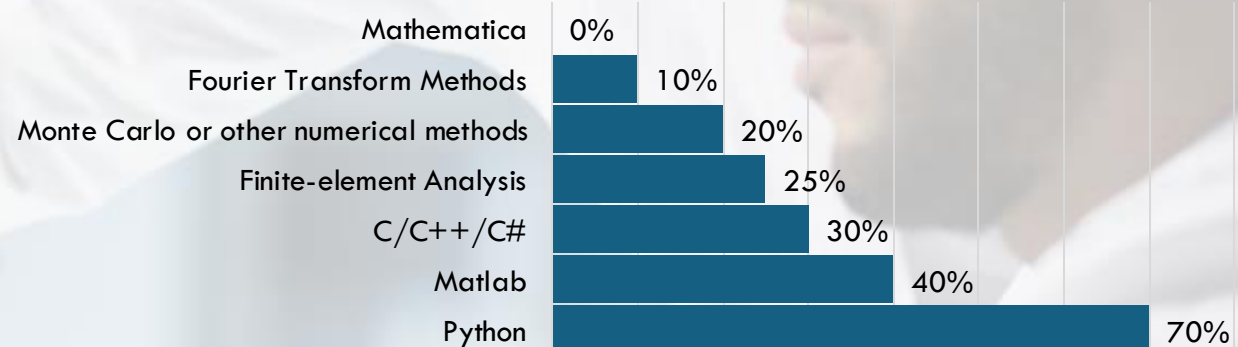
Sub-disciplines



Experimental Techniques



Computational/Modeling

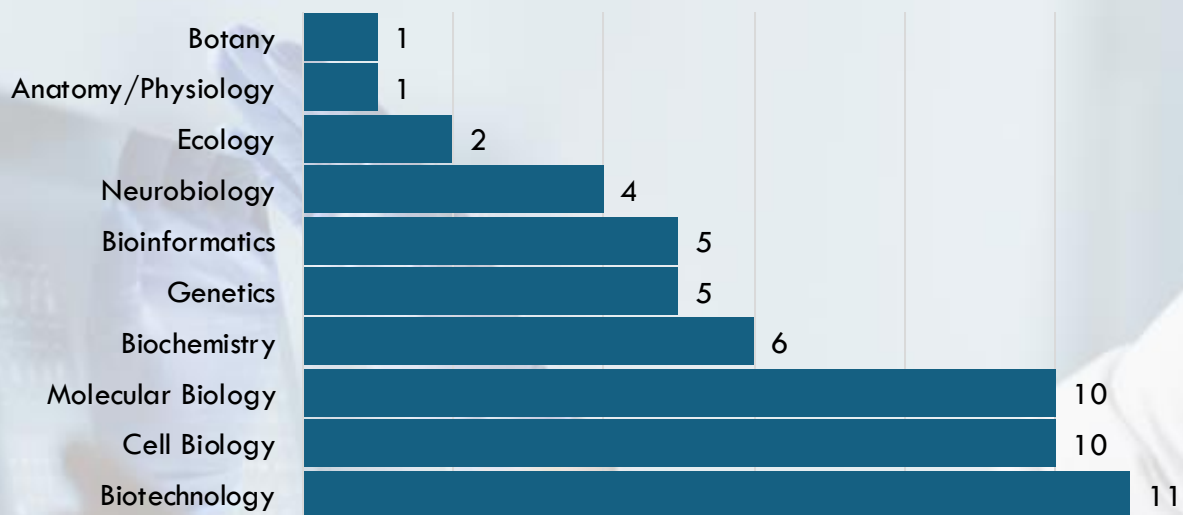


Discipline skills focus: Biology

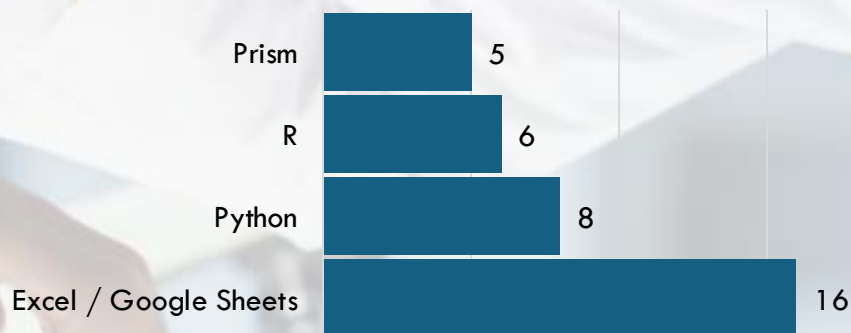
17 respondents; 13 small + 4 MedLarge

- Subdisciplines (highly valued): Biotechnology, Cell Biology, and Molecular Biology
- Methods and Instrumentation: pipetting, working in a biosafety cabinet, microscopy, sterile technique, and cell culture
- Data Analysis: excel and google followed by Python

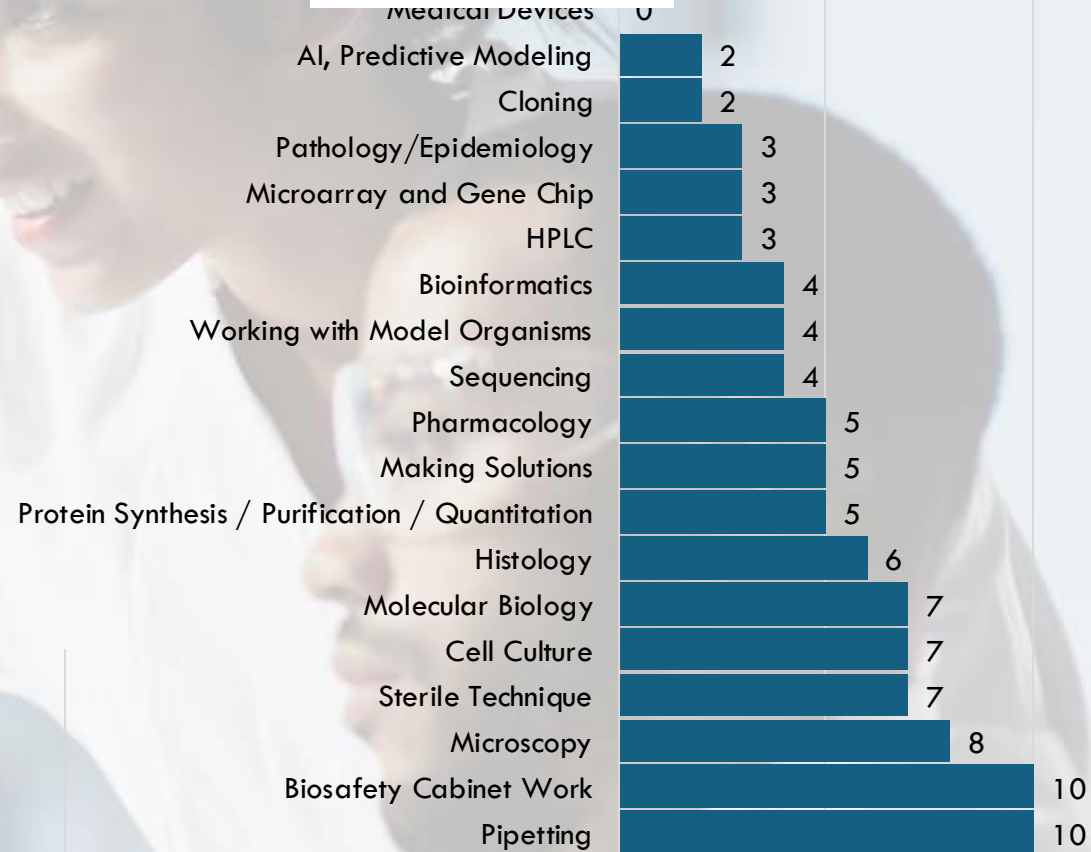
Sub Disciplines



Data Analysis Software



Methods and Instrumentation



Discipline skills focus: CS/DS

21 respondents; 14 small, 7 MedLarge

Computer Science

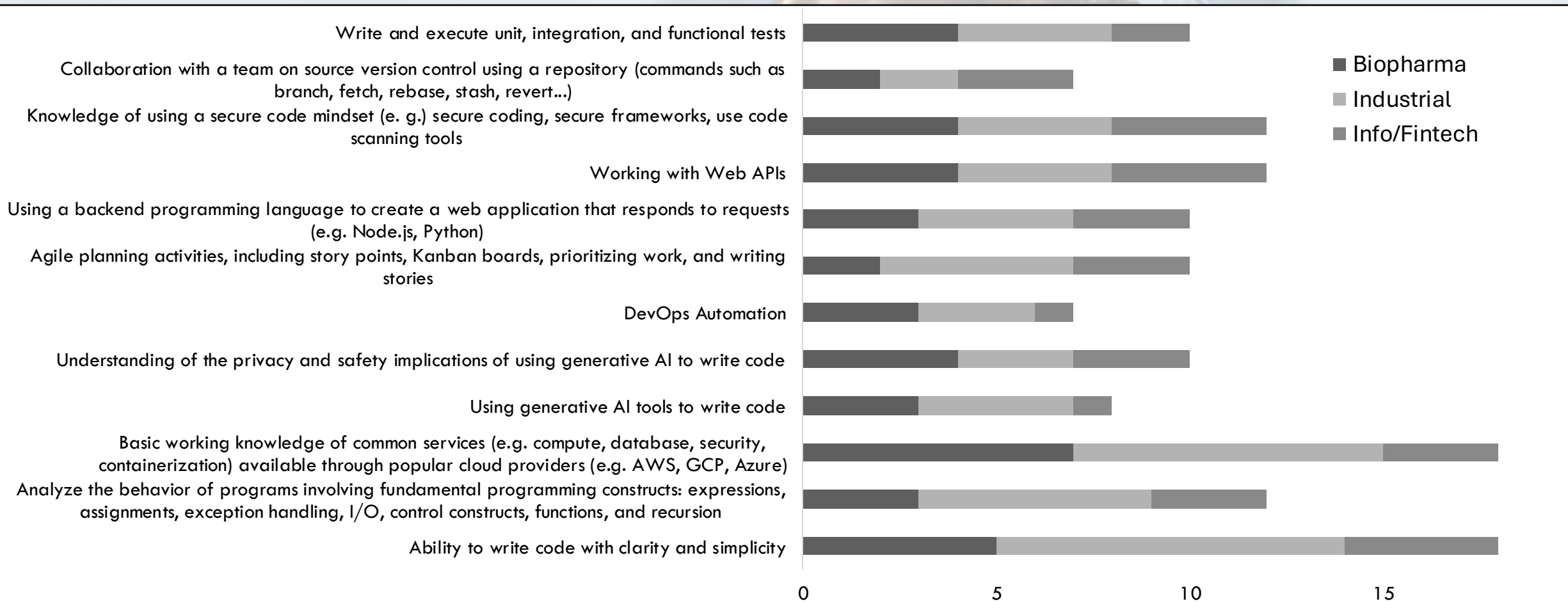
- Most popular: ability to write clear and simple code and basic working knowledge of common services
- Relatively few prioritized experienced with AI code writing tools, version control, and DevOps automation
- “Other” responses included thinking logically, ability to resolve/design new features based on business use cases, and spreadsheets



Discipline skills focus: CS/DS (21 respondents; 14 small, 7 MedLarge)

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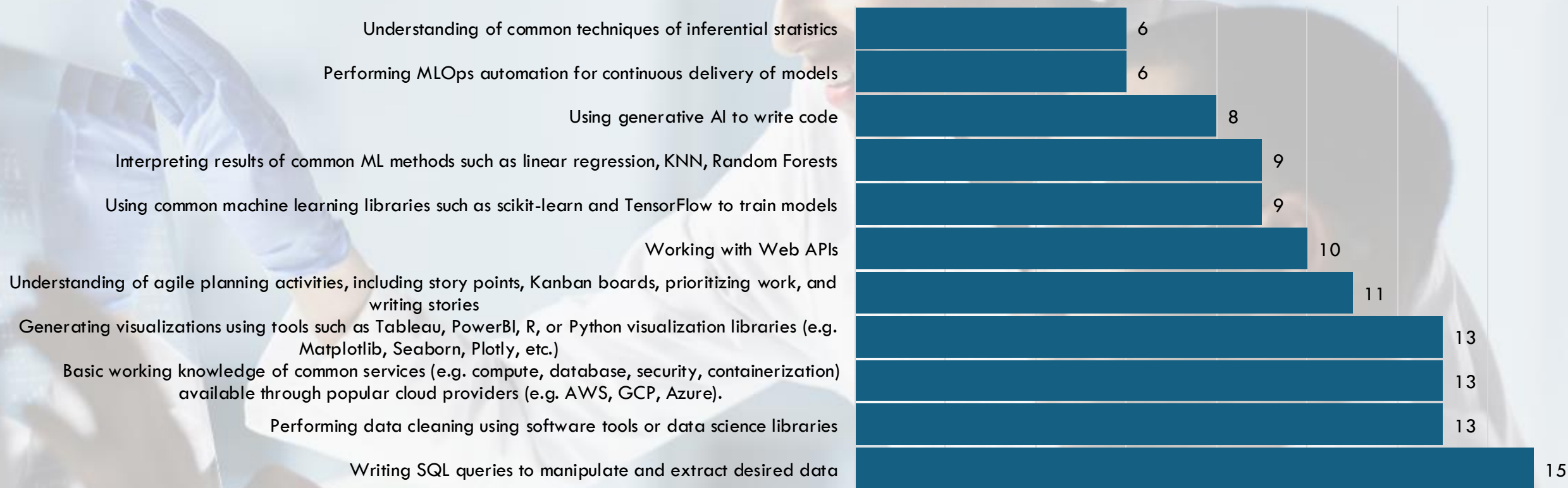
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Discipline skills focus: CS/DS (21 respondents; 14 small, 7 MedLarge)

Data Science

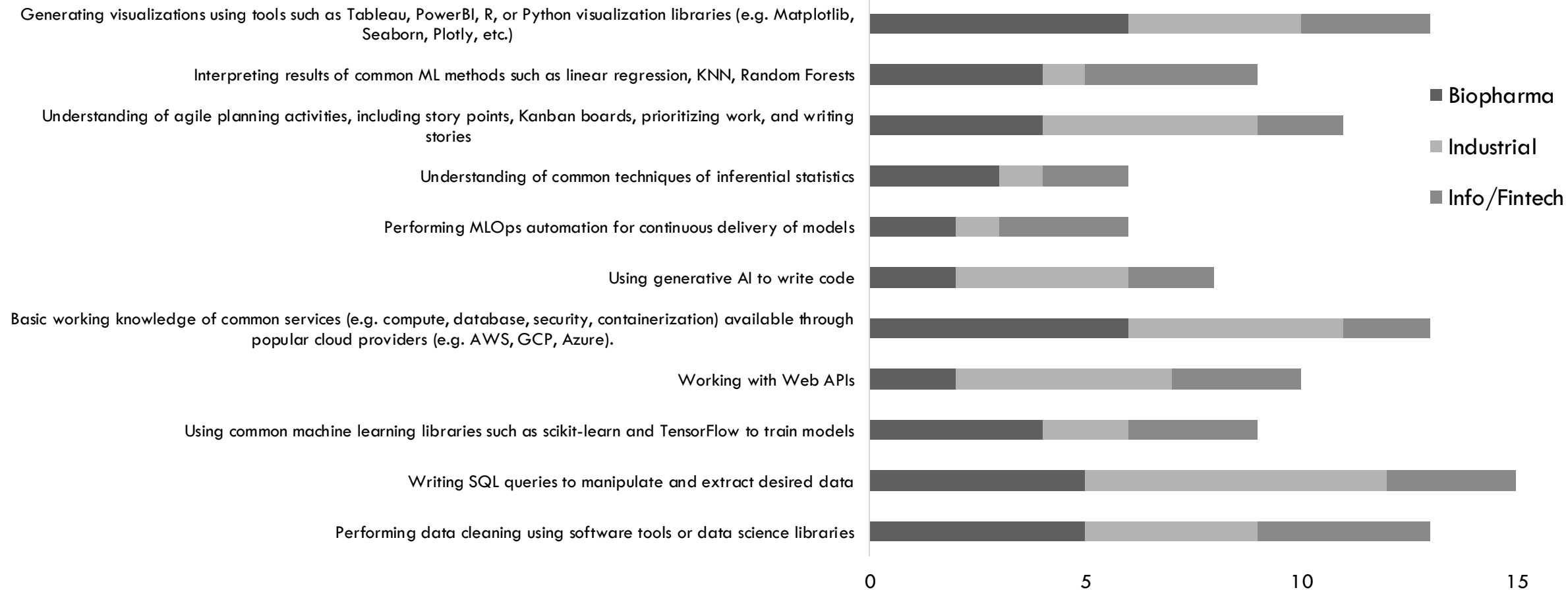
- Machine learning skills were not as widely valued as more general database, security, and data housekeeping skills
- Writing SQL database queries was the most in-demand skill (15/21 companies)
- Data cleaning, knowledge of common services such as security and containerization, and generating visualizations (13/21)
- Relatively few prioritized experienced automating machine learning or understanding inferential statistics (6/21)



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Data Science

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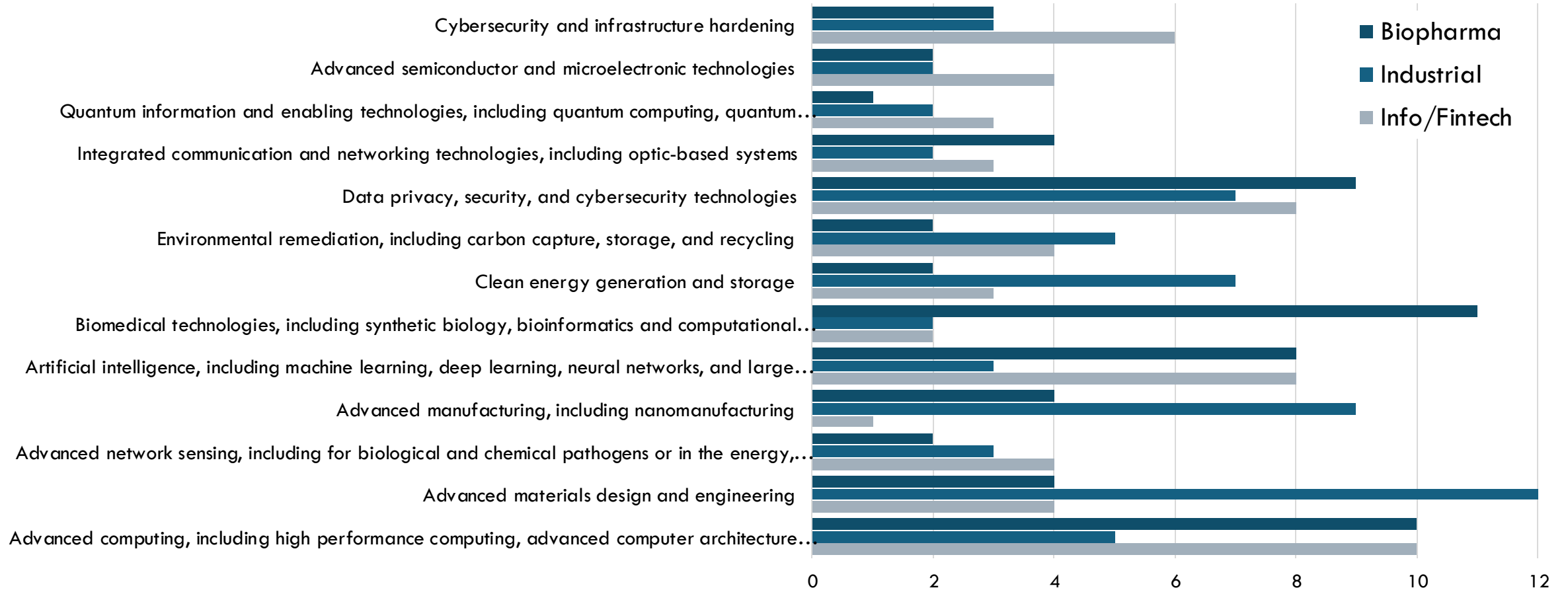
Looking ahead: Emerging Technologies

- All companies were asked which of the following 11 Emerging Technologies they thought would be relevant in the next 2-5 years
- 47 indicated at least 1 area was relevant
- 3 supplied custom responses including “New pharmaceutical regulations”, “Clean Energy”, and “Advanced Stable Photonics”

Area	Responses
Advanced computing, including high performance computing, advanced computer architecture and modeling, data processing	25
Data privacy, security, and cybersecurity technologies	24
Advanced materials design and engineering	20
Artificial intelligence, including machine learning, deep learning, neural networks, and large-scale AI models	19
Biomedical tech, including synthetic bio, bioinformatics and computational bio, bio-engineering at the cellular level, and viral systems	15
Advanced manufacturing, including nanomanufacturing	14
Clean energy generation and storage	12
Cybersecurity and infrastructure hardening	12
Environmental remediation, including carbon capture, storage, and recycling	11
Advanced network sensing, including for biological and chemical pathogens or in the energy, health, or environmental sectors	9
Integrated communication and networking technologies, including optic-based systems	9
Advanced semiconductor and microelectronic technologies	8
Quantum information and enabling technologies, including quantum computing, quantum sensing and quantum materials	6

Looking ahead: Emerging Technologies

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Results Summary: *what is highly valued?*

- 54 respondents/companies: range 2 – 500+ employees, age range 1 – 100+ All respondents highly value “working with a diverse” team
- Modest differences in terms of the “generals” between sectors and
 - Biopharma more highly values degree + research and hands-on lab experience
 - Info/Fintech more highly values technical community and oral presentation
- Chemistry
 - Subdisciplines: Organic and Analytical Chemistry
 - Techniques: Chromatography and Extraction; Acquire and Interpret Data
 - Instrumentation: Mass Spec and HPLC
- Computer Science
 - Ability to write code with clarity and simplicity
 - Basic working knowledge of common services

Results Summary: *what is highly valued?*

- 54 respondents/companies: range 2 – 500+ employees; age range 1 – 100+
- Data Science
 - Visualizing, Manipulating, and Extracting Data
 - Some modest differences between sectors
- Emerging Technology

Sector(s)	Technology
All	Data privacy and cybersecurity
Info/Fintech and BioPharma	Artificial Intelligence, Machine Learning, Deeping Learning
Info/Fintech and BioPharma	Advanced, high-performance computing
BioPharma	Bioinformatics and Synthetic Biology
Industrial	Advanced manufacturing as well as material design and engineering

Conclusions

- Maintaining an understanding of the evolving and ever-changing needs and innovation landscape for the Connecticut is essential
- Highly likely that hiring needs have changed because of some of the macroeconomic influences, especially within the last 5 month
- Nevertheless, we believe that the skills sought have not significantly changed over the same period
- Let us partner together to discuss next steps and/or do this again with more companies?!

Acknowledgements

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- Special thanks to the project team led by Dr. Joey Gennaro (now Assistant Director of Innovation at Technolutions, New Haven) and Stephanie Fischer (lead writer) and Professor of English, specializing in Technical Writing
- Questions were developed by SCSU faculty, including Dr. Imad Antonios (CS/DS), Dr. Matthew Enjalran (Emerging Tech), Dr. Evan Finch (Physics), Dr. Rachel Jeffrey (Biology), and Dr. Todd Ryder (Chemistry)
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