Students solving BIG problems

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Careers for Mathematics Students

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Jobs founded on mathematics, statistics, and operations research are specifically projected to expand by almost 30%

– from AMS BIG Math Career Preparation Initiative

What are some non-teaching careers for math students?

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What do you think?

Career: Data scientist

- Professional Sports Teams
- Walmart
- Nike
- Google

Career: Technology consultant

- Raytheon
- General Dynamics
- Lockeed Martin
- Boeing

Career: Financial analyst

- Goldman Sachs
- RBS Global Banking
- Capital One

Career: Operations researcher

- UPS
- Airlines
- Hospitals
- Government

Career: Software engineer

- Toyota
- Epic
- Microsoft
- Google

Commercial Break!

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- do a research project or a summer internship

What types of problems do companies need math students to solve?

Problems from business, industry, government (BIG)

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Problem: Using data provided by Kongregate, develop an algorithm to help determine whether a submitted account is real or fraudulent.

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Problem: Using data supplied by Intelycare, forecast the demand for nurses so that hospitals can have a better way to know how many substitute nurses may be needed for any time period and how long it may take for a nursing shift to fill at a given price.

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- is based on an actual problem from industry
- students work in groups solving a problem from industry
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- students interact with a consultant from industry
- involves students improving their communication skills
- prepares students for careers

That course is PIC Math!

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PICMath

Preparation for industrial careers in mathematical sciences

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Components:

- summer 3-day faculty training workshop
- spring semester course for students
- student conference

3-day faculty training workshop

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Discussion topics:

3-day faculty training workshop

Discussion topics:

- preparation for spring PIC Math course
- what to do in the course instead of lecturing
- discussion of types of BIG problems
- guidance on developing industry connections
- how to mentor students in research

Where can we find companies that have problems that math students can solve?

Examples of industrial partners that PIC Math faculty have worked with:

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- **Schools, Colleges, and Universities:**
  - admission's office
  - scheduling
  - high-impact programs (freshman learning communities, student research and internships, international programs)
- **Nonprofits:**
  - museums
  - animal care centers
  - sports team
- **Local Government:**
  - bus routes and schedules
  - parks
- **Local Utility Companies:**
  - water, sanitation, electricity
- **Finance and Insurance Companies:**
  - banks, insurance companies, investing firms

Examples of industrial partners that PIC Math faculty have worked with:

- **Businesses (local, online, and national):**
  - Coca Cola
  - Staples Inc (business supplies)
  - Box Office Analyst (box office and film information)
  - Kerry Group (food company)
  - Fastenal (industrial supplies)
  - Kongregate (online video rating site)
- **Technology Companies:**
  - Weather Decision Technologies Inc
  - DEKA Research and Development
  - Sproxil Inc
  - MITRE
- **Hospitals and Science Laboratories:**
  - Massachusetts General Hospital
  - Heart Artery and Vein Center
  - National Security Technologies
  - Pacific Northwest National Lab

Example 3:

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Problem: Using data on water pumping and hotel occupancy, describe the effect rainfall and hotel occupancy have on the pumping rate and time.

Problems from BIG

Example 4:

Background: U.S. professional sport teams sometimes offer fan souvenirs or promotions for attending a game. The purposes of the fan promotions are to increase fans' interest and engagement with the team, to generate goodwill, to increase ticket sales. Students were given a dataset that includes fan promotions from all the U.S. Major League Baseball teams.

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Problem: Using data provided, determine what types of promotions have the greatest effect on ticket sales. .

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Each PIC Math team communicates their work by

- writing a report on the research problem and solution
- recording a video of the team presenting he research problem and solution
- presents at a PIC Math session at a summer conference

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Participation data (for the first 5 years)

- 154 U.S. universities/colleges
- 179 math/stat faculty members
- over 2000 students at the undergraduate level
  - 41% female
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- over 150 conference presentations by undergraduates
- over 150 industrial partners have provided research problems and consultants

Thank you!

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