Algorithms for Hire

Lindsey Zuloaga, Ph.D.
Director of Data Science

HireVue

THE CANDIDATE EXPERIENCE

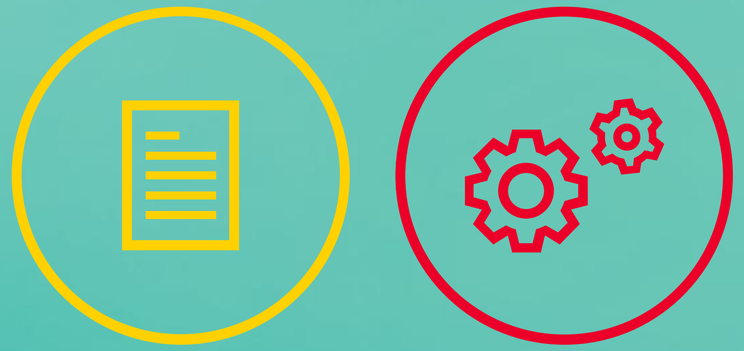
Application

Resume

Cover Letter

JESSICA SAMPSON
555-555-5555 • jsamp@gmail.com • 123 Pleasant Street, Boulder, CO 12345
MARKETING MANAGER
Campaign Development ◇ Product Management ◇ Strategic Planning
Highly knowledgeable, innovative, and progress-driven marketing professional with proven strengths in creating and driving successful campaigns and business development initiatives; valued ability to lead multidisciplinary teams, manage multi-million dollar project budgets, and collaborate effectively with staff on all levels. Continually search for ways to improve processes, increase efficiency, and identify opportunities for cost savings. Thrive on new growth opportunities through market research and analysis, product expertise, and proven business acumen. Key skills include:
Project Management.Brand/Identity Development.Resource Allocation.SEO.Outreach & Public Relations
Multi-channel Marketing.Vendor Relations.Client Satisfaction.Staff Training.Event Planning
PROFESSIONAL EXPERIENCE
COMPANY NAME – Boulder, CO 2007 to 2011
Owner, Marketing Manager
Built, owned, and operated highly successful athletic events organization company. Employed staff of 6 including Events Director, Office Manager, Bookkeeper, Marketing Coordinator, Volunteer Manager, and Operations Manager; supervised 50+ volunteers. Facilitated 10 to 15 events annually, including 5K, 10K, and half marathon running events; 5K participants. Orchestrated for more than 1,500 runners as well as annual budget of $50K. Defined metrics to measure plan success and determine best strategy for resource allocation. Secured and retained sponsors and collaborated with outside graphic designers to produce company collateral, website, email campaigns, logos, and merchandise, ensuring brand and message consistency.
•	Increased revenues and cut costs each year, including 50% reduction in expenses in 3rd year and 30% increase in profitability in 4th year of operation.
•	Identified vendor in China for cycling musette bags, saving 80% over US manufacturers' costs.
•	Built brand and expanded participation in Tour de Boulder event; developed and launched successful merchandise marketing plan resulting in complete sell out of cycling jerseys and t-shirts.
COMPANY NAME – Boulder, CO 2005 to 2007
Logistics Manager
Supervised all logistics and freight operations for manufacturer of fleece clothing and accessories with 75 employees; challenged to turn around struggling department. Managed freight budget of $2M+, directing all purchases and shipments; worked closely with 3PL warehouse partner in administering $3M+ distribution budget. Provided direct internal and external customer service and support. Co-facilitated creation and implementation of Lean Manufacturing curriculum and continually identified ways to improve warehouse efficiencies, save costs, and increase accuracy of picking/packing and shipping.
•	Resolved departmental issues and restructured processes and procedures to bring stabilization to logistics and freight operations within 6-month time period.
•	Maintained 99.5% on-time pick rate with both national and international vendors.
•	Successfully negotiated lower freight rates, cutting expenses by $150K in one year.
•	Created new shipping carton that saved $175K in first year of use, lowered customer shipping costs, and promoted company's sustainability efforts by providing recyclable/reusable option.
COMPANY NAME – Boulder, CO 2003 to 2005
Project Manager & Freight/Logistics Manager
Held dual role for provider of gift card packaging solutions and promotional programs with $10M in annual revenues and 15 employees. Oversaw production schedules and liaised between in-house staff and vendors in Asia to ensure product quality and process efficiency. Created various systems and programs to improve workflow and save project time and expenses. Developed reverse production schedules to coordinate client and vendor timelines and expectations.
•	Devised and implemented highly effective freight optimization software which was adopted by ABC (Company Name's largest

RESUME ANALYTICS



Number of jobs

Years experience

University & College

GPA

Jane Smith

Address Line 1, Address Line 2, City, State Zip • (201) 2[illegible]1414 • jane.smith@gmail.com

Career Objective

Administrative Assistant with 6+ years of experience working directly for the President of 3M Inc., a Fortune 500 company. Possesses impeccable written and verbal communication skills and excellent interpersonal skills.

Core Competencies

- Customer Service
- Cost Efficient
- Detailed and Organized
- Supplier Relationship

Professional Experience

3M INC., New York, NY

Administrative Assistant, Apr 2006-present

- Read and analyze incoming memos, submissions, and reports to determine their significance and plan their distribution.
- Conduct Research, compile data, and prepare papers for consideration and presentation by executives, committees and boards of directors.
- Coordinate and direct office services, such as records, departmental finances, budget preparation, personnel issues, and housekeeping, to aid executives.
- Prepare invoices, reports, memos, letters, financial statements and other documents, using word processing, spreadsheet, database, or presentation software.

FLORIDA DEPARTMENT OF SOCIAL SERVICES, ORLANDO, FL

Rehabilitation Counselor, Aug 2004-May 2006

- Confer with clients to discuss their options and goals so that rehabilitation programs and plans for accessing needed services can be developed.
- Prepare and maintain records and case files, including documentation such as clients' personal and eligibility information, services provided, narratives of client contacts, and relevant correspondence.
- Develop and maintain relationships with community referral sources, such as schools and community groups.
- Analyze information from interviews, educational and medical records, consultation with other professionals, and diagnostic evaluations to assess clients' abilities, needs, and eligibility for services.

Education

FLORIDA STATE UNIVERSITY, Orlando, FL

Bachelor of Art in English, May 2004

- GPA: 3.3/4.0
- Published in school's newspaper editorial
- Summer Internship for the New York Times

Additional Skills

- Proficient in Microsoft Office and Adobe Illustrator CS5
- Bilingual in Spanish and English
- Certified CPR and First Aid

Awards and Honors

- Employee of the Month for 3 consecutive months in H&M
- Won the "Writer's Digest" 2002 Award
- Awarded an employee travel award due to "Performance Excellence" 2 years in a row through 3M Inc.

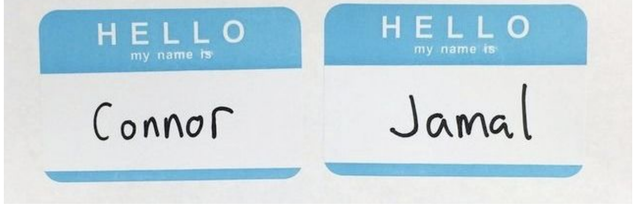
HUMAN BIAS

ATTRACTIVENESS

AGE

GENDER

RACE

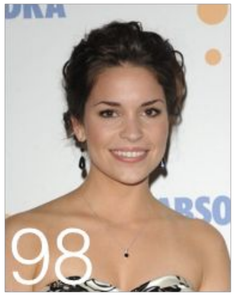


SIMILARITY

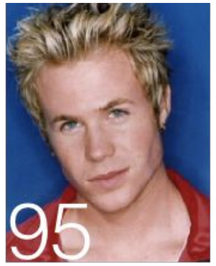
ATTRACTIVENESS BIAS

ATTRACTIVENESS BIAS

Ralph Fiennes

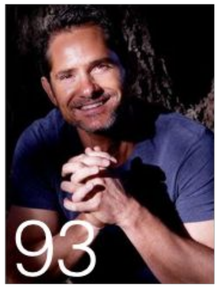


Mandy Musgrave

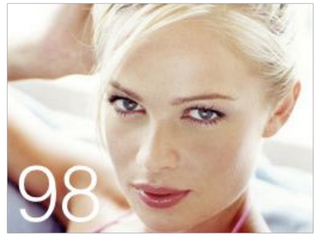


Ashley Parker Angel

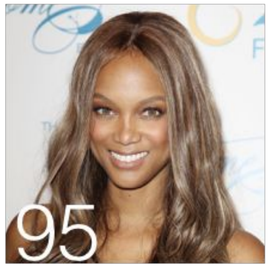
Candy Lo



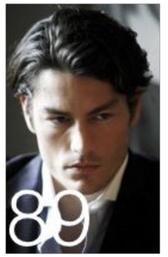
Joshua Kadison



Imogen Bailey



Tyra Banks



Tyson Ballou

Carlos Bernard

Bev Perdue

Andrei Kirilenko

Sonny Perdue

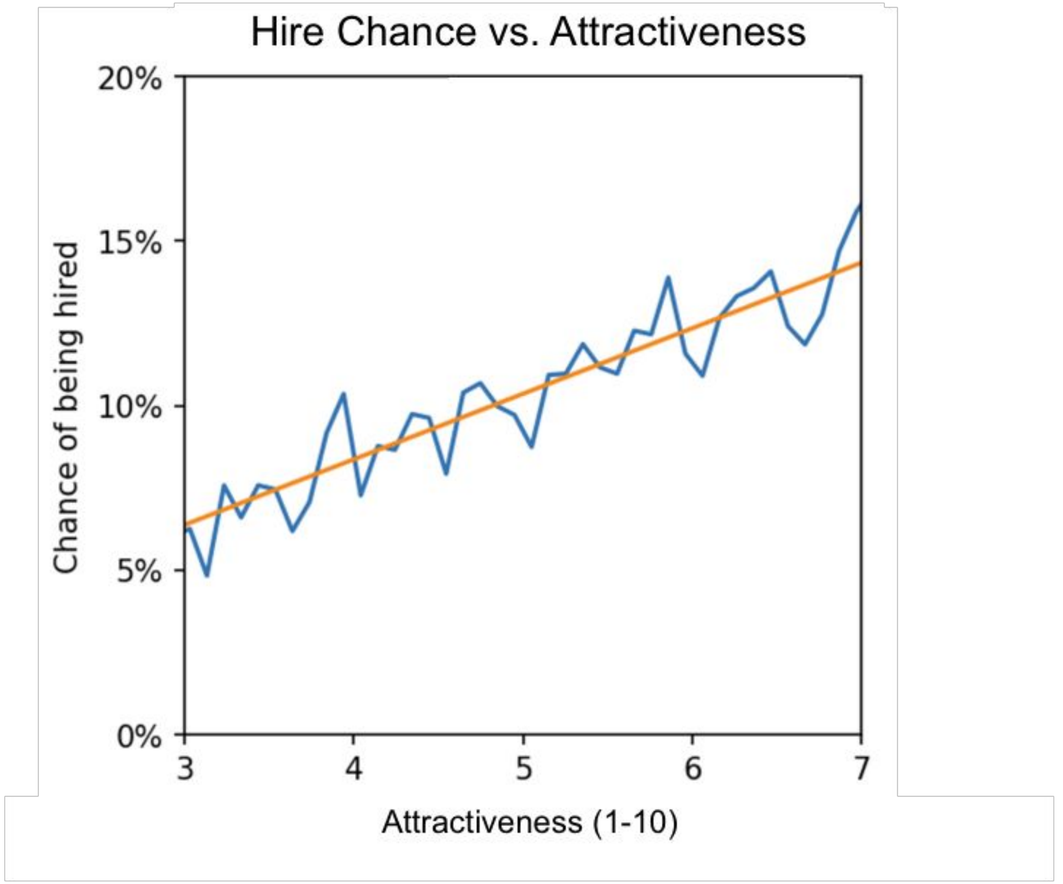
Margaret Hodge

Chuck Grassley

ATTRACTIVENESS BIAS

RETAIL ASSOCIATE FOR A TRENDY CLOTHING STORE:

CHANCE OF BEING HIRED FOR 7/10 IS **2 X** THAN 3/10.



vodafone

IBM Watson

Unilever

UNDER ARMOUR

dunkin' brands

STANCE

overstock.

HILTON WORLDWIDE

HBO

ORACLE

Honeywell

Carnival

SEQUOIA

DOW JONES

PANDA EXPRESS GOURMET CHINESE FOOD

BOSTON RED SOX

Mount Sinai

Keurig DrPepper

ATLANTA PUBLIC SCHOOLS Making A Difference

ConocoPhillips

FranklinCovey

ScottsMiracle-Gro

rackspace.

Penguin Random House

URBAN OUTFITTERS

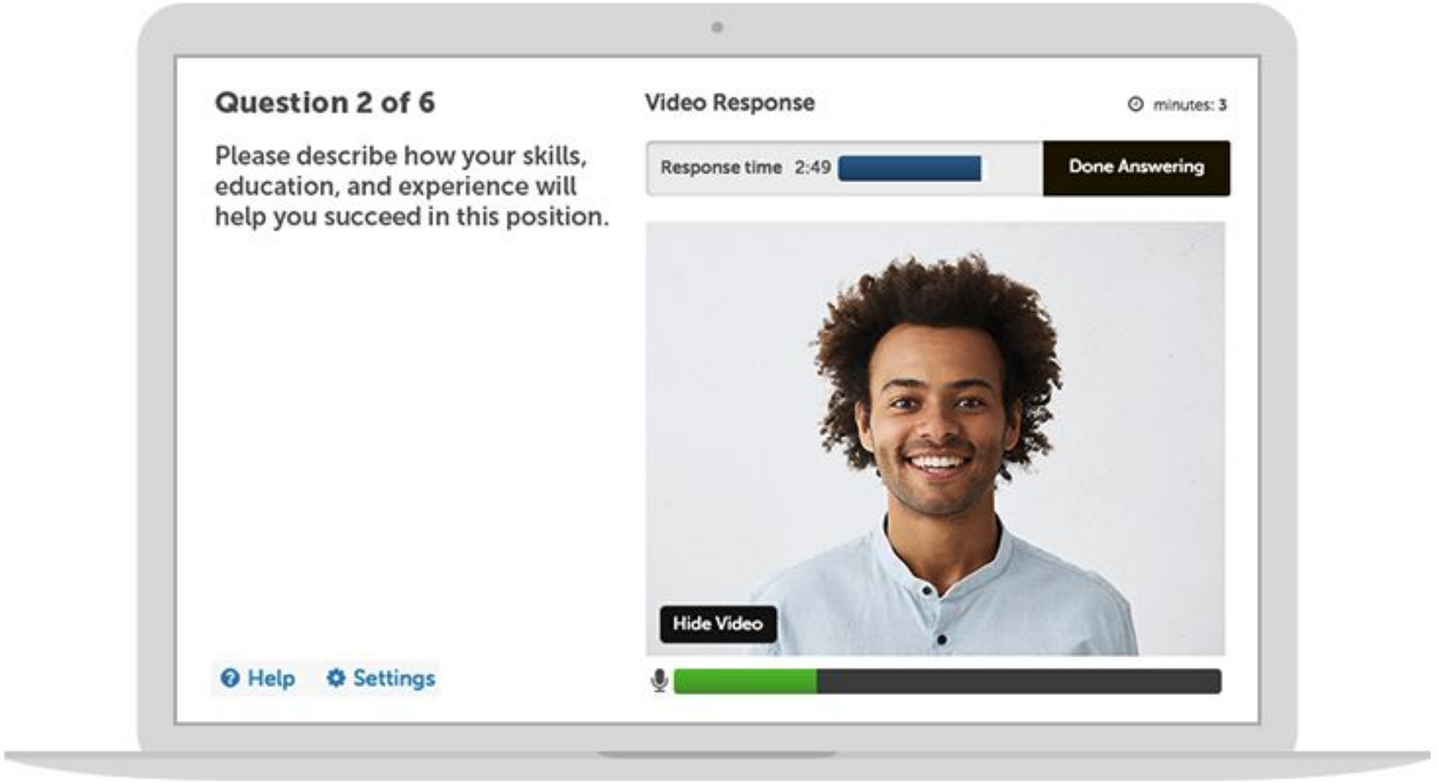
BYU BRIGHAM YOUNG UNIVERSITY

Discovery COMMUNICATIONS

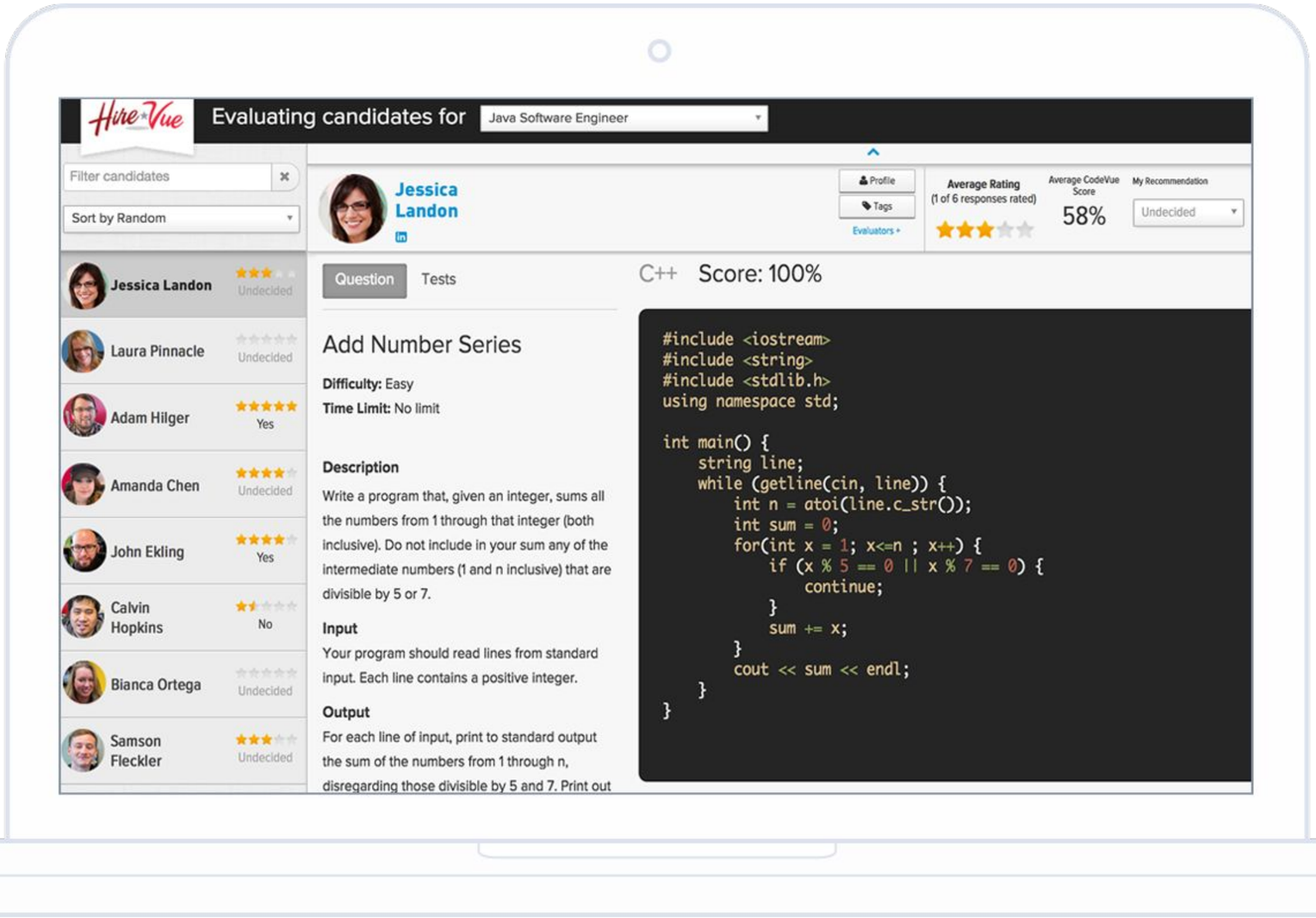
Adventist HEALTH SYSTEM

intel

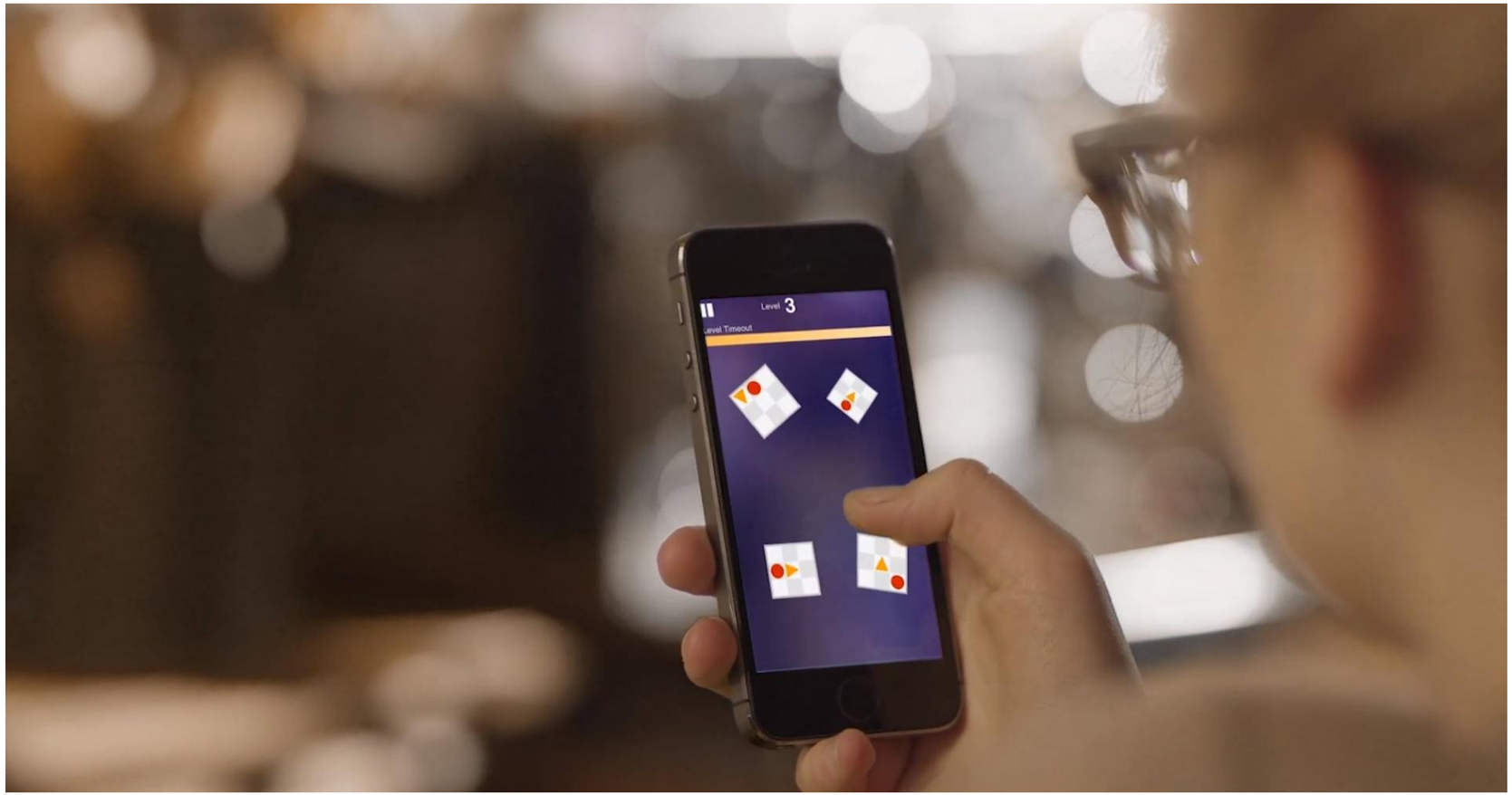
ON DEMAND VIDEO INTERVIEWS



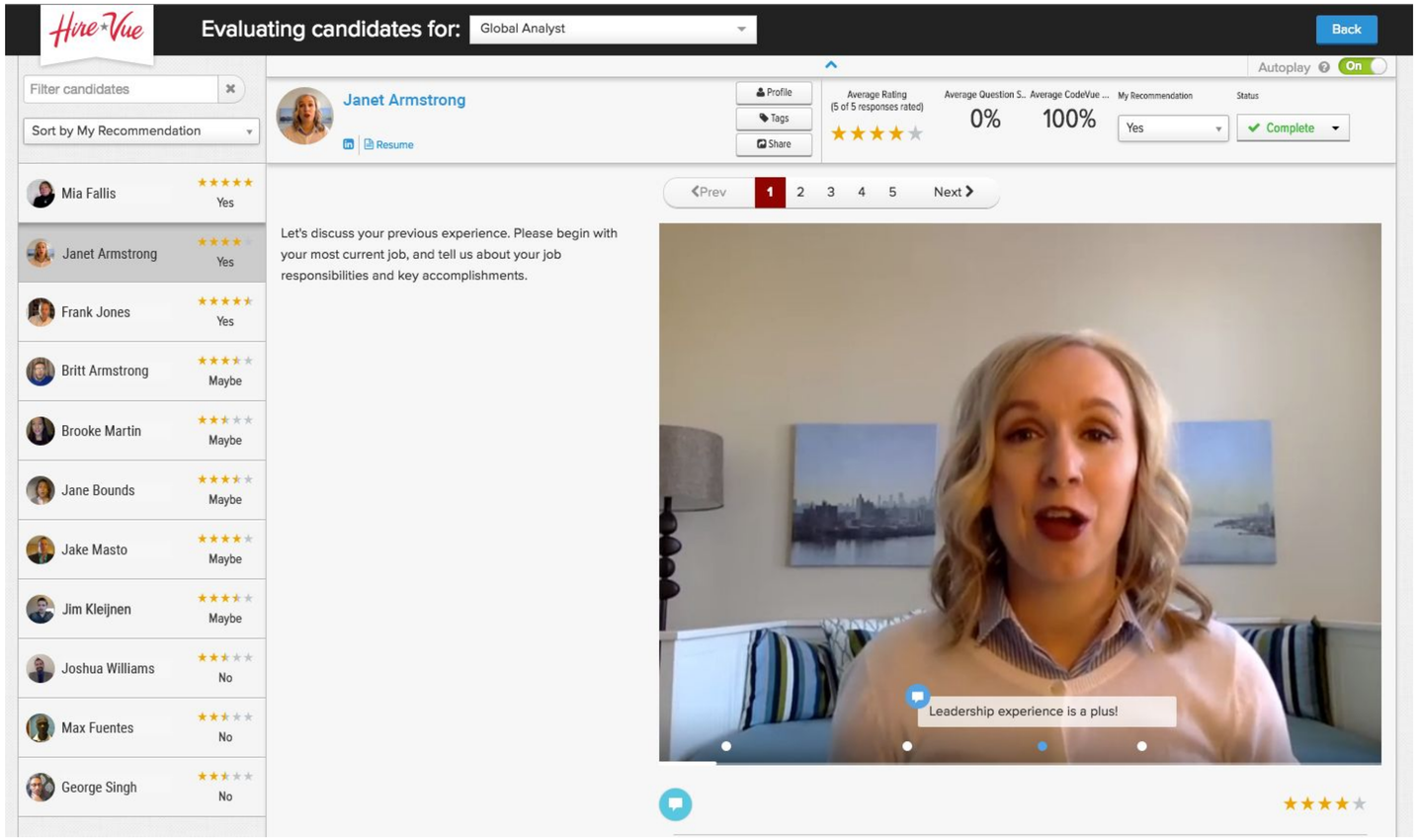
CODING CHALLENGES



COGNITIVE & SOCIAL GAMES



ON DEMAND VIDEO INTERVIEWS



HIREVUE SCIENCE TEAM

IO PSYCHOLOGISTS

Global Team, Customer Facing, Assessment Design, Validation, Legal Defensibility

- 5 Ph.D. IO Psychologists
- 8 Master's Degrees in IO Psychology

DATA SCIENTISTS

AI Research, AI Development, Analytics

- 4 Ph.D. Data Scientists (Physics, Bioengineering, Mathematics)
- 3 Master's Degrees (Computer Science, Image Analysis, Economics, etc.)

PRODUCT TEAM

Product Strategy, Design, Development

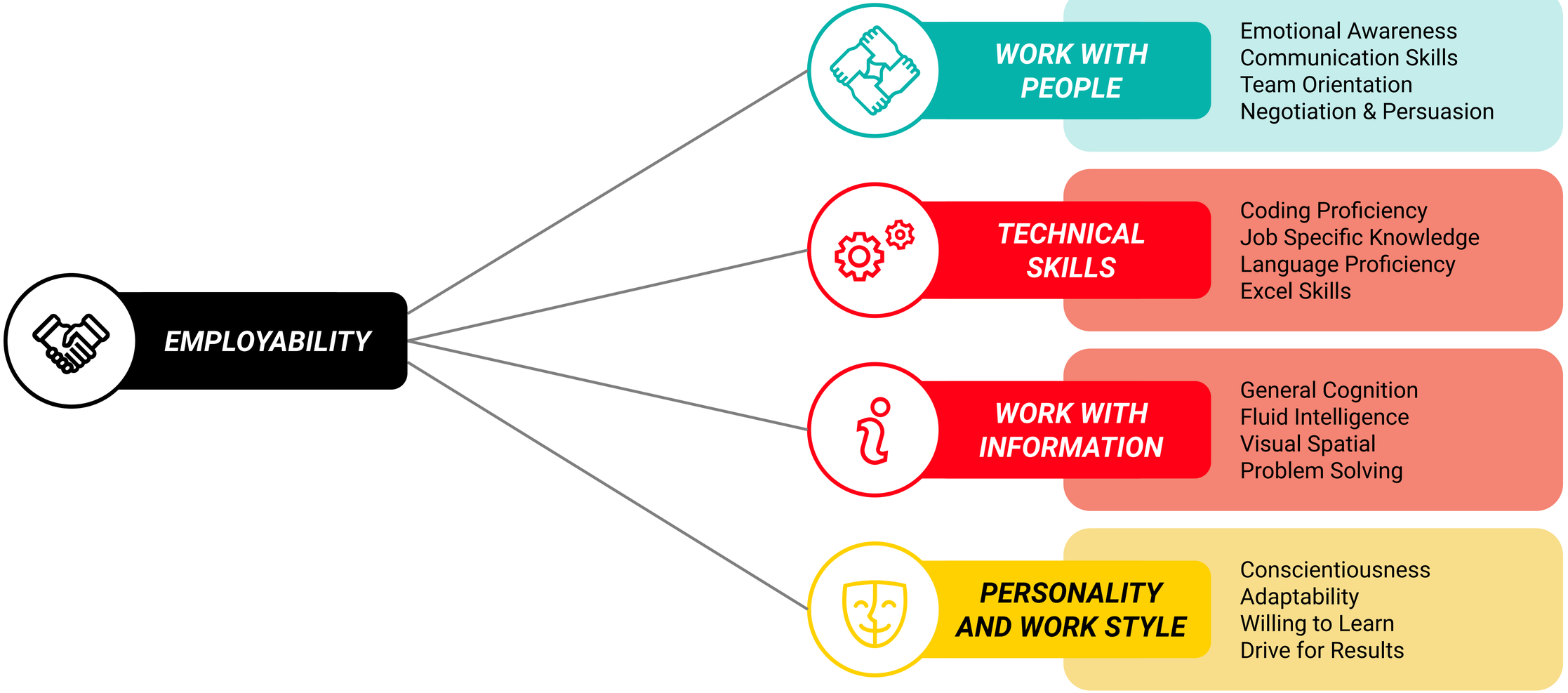
- Ph.D. and Master's Degree in Software Development and Video Analytics

EXPERT ADVISORY BOARD

Leading Experts in IO Psychology, Data Security and Privacy, Algorithmic Fairness, and Deep Learning applications

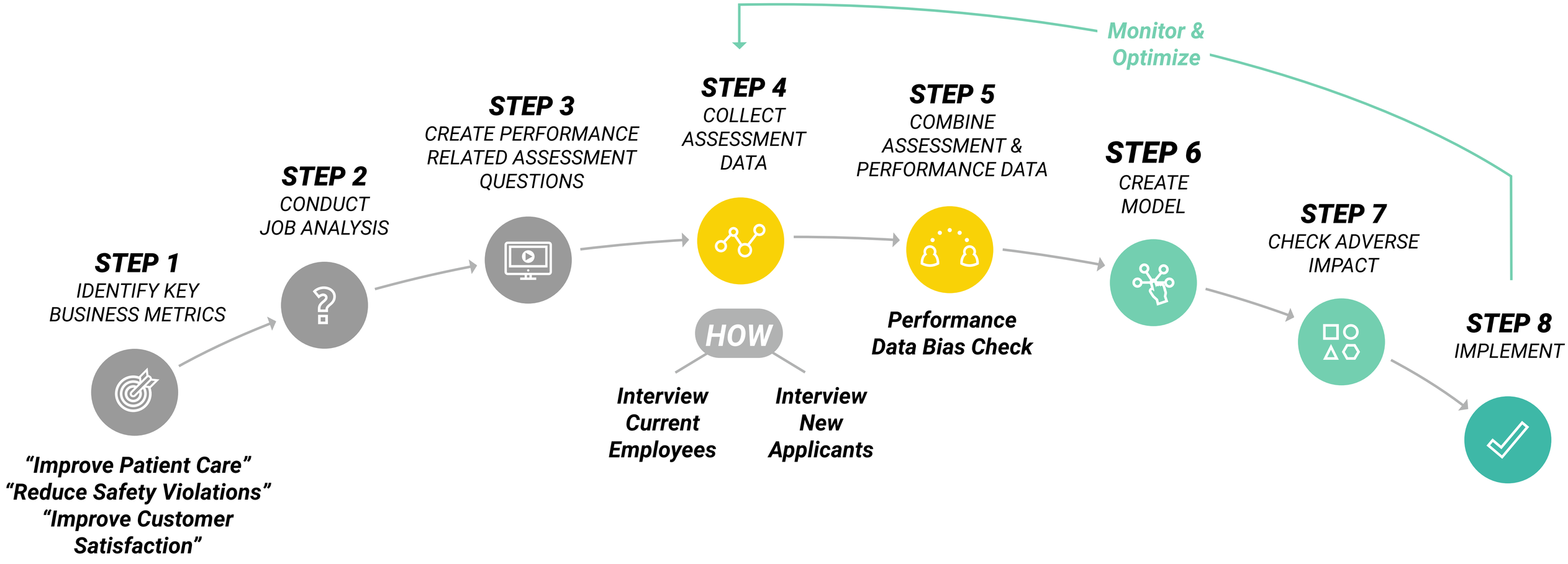
COMPETENCY-BASED MODEL

Measure competencies most relevant to job-specific performance

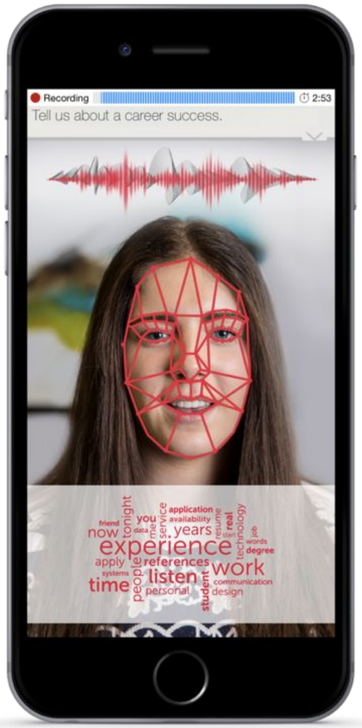


HIREVUE ASSESSMENTS

BUILD PROCESS AND STRATEGY

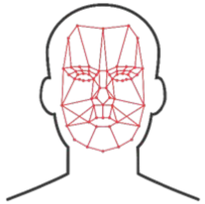


DIGITAL ASSESSMENTS



TEXT

AUDIO



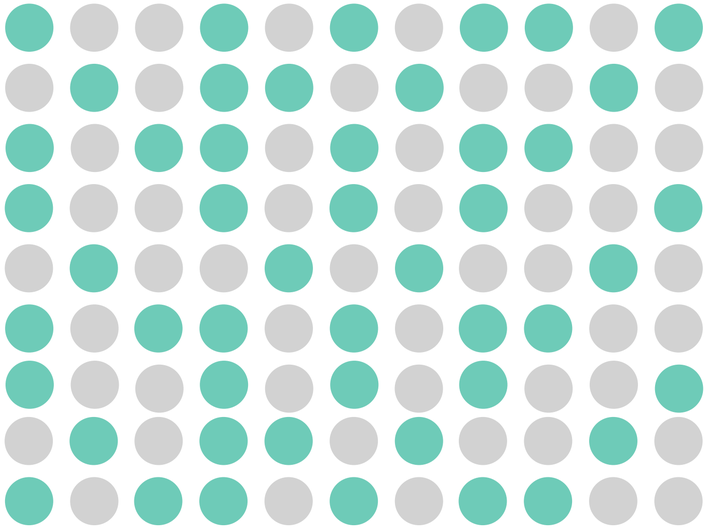
VIDEO

ASSESSMENT ALGORITHM

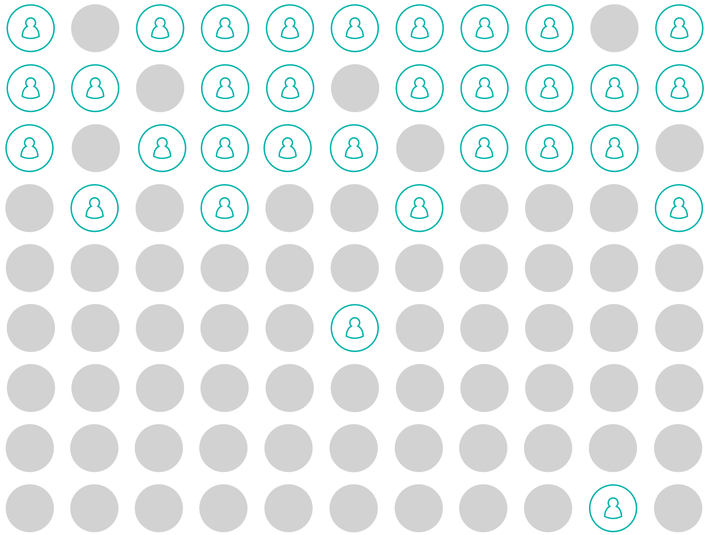
RANKING BASED ON BUSINESS METRIC

DIGITAL ASSESSMENTS

TOP CANDIDATE DISTRIBUTION WITHOUT ASSESSMENTS



TOP CANDIDATE DISTRIBUTION WITH ASSESSMENTS

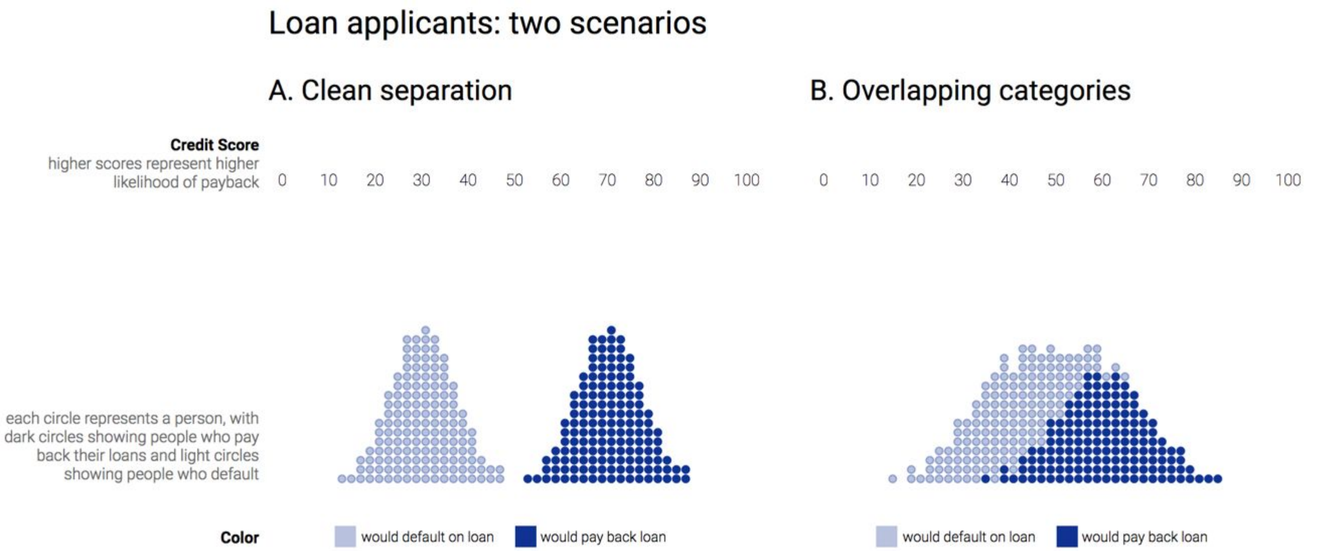


Out of the people hired, humans have a 0.55 AUC at predicting top performers, our models have a 0.66 AUC.

WHAT ABOUT BIAS?

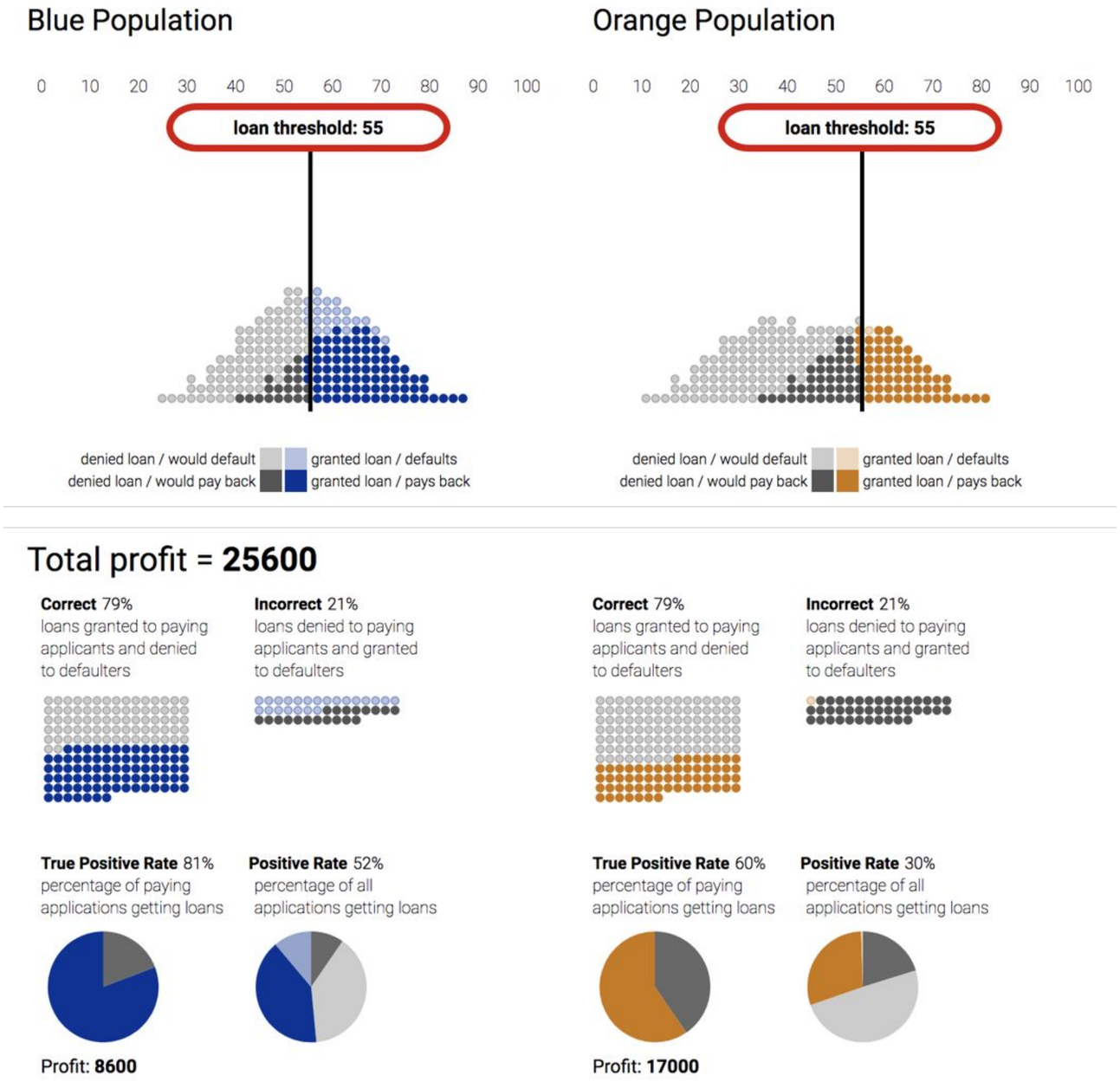
FAIRNESS

Attacking discrimination with smarter machine learning



https://research.google.com/bigpicture/attacking-discrimination-in-ml/

FAIRNESS



https://research.google.com/bigpicture/attacking-discrimination-in-ml/

HIRING

JOB ASSESSMENTS

AVOIDING ADVERSE IMPACT:

"THE 4/5^{THS} RULE"

~~*DEMOGRAPHIC PARITY: P(Y=1|C1) = P(Y=1|C2)*~~

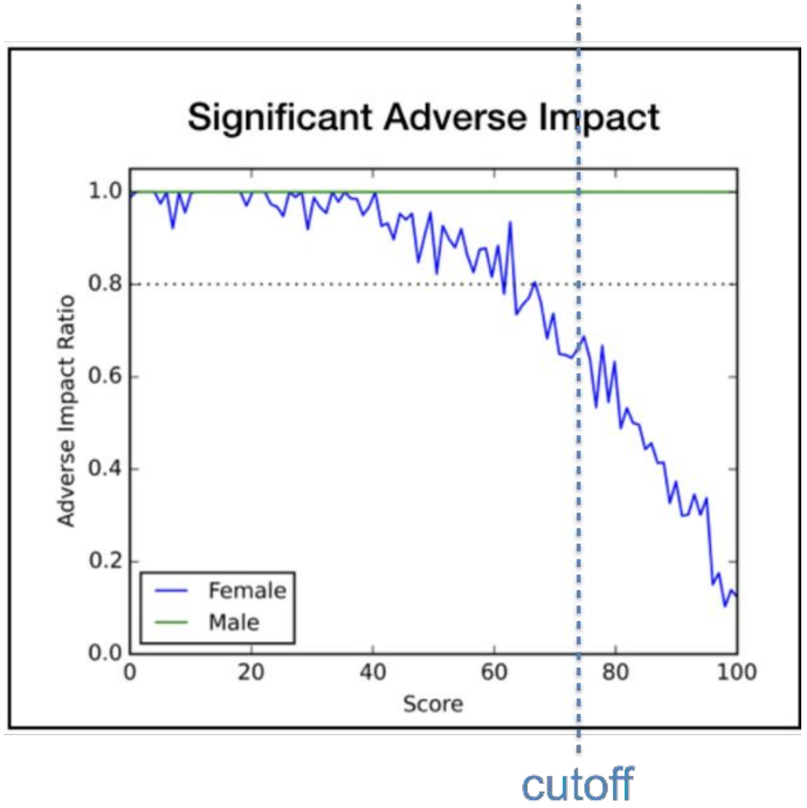
"The passing rate for any group should not be less than 80% (or 4/5^{ths}) of the highest scoring group."

$$P(Y=1|C_1) > 0.8 \times P(Y=1|C_2)$$

JOB ASSESSMENTS

AVOIDING ADVERSE IMPACT:

"THE 4/5^{THS} RULE"

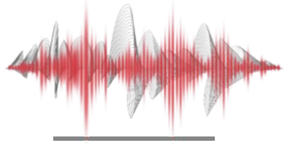


JOB ASSESSMENTS

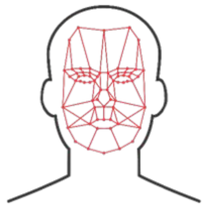
AVOIDING ADVERSE IMPACT:

“THE 4/5^{THS} RULE”

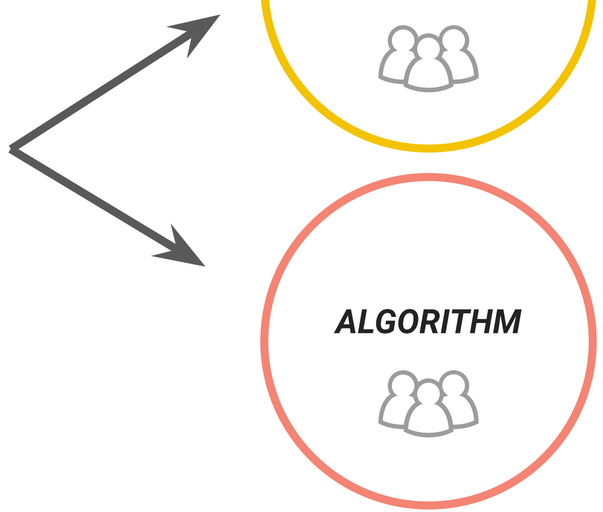
TEXT



AUDIO



VIDEO



TOP PREDICTORS:

~~*Feature12*~~

~~*Feature222*~~

~~*Feature978*~~

~~*Feature8931*~~

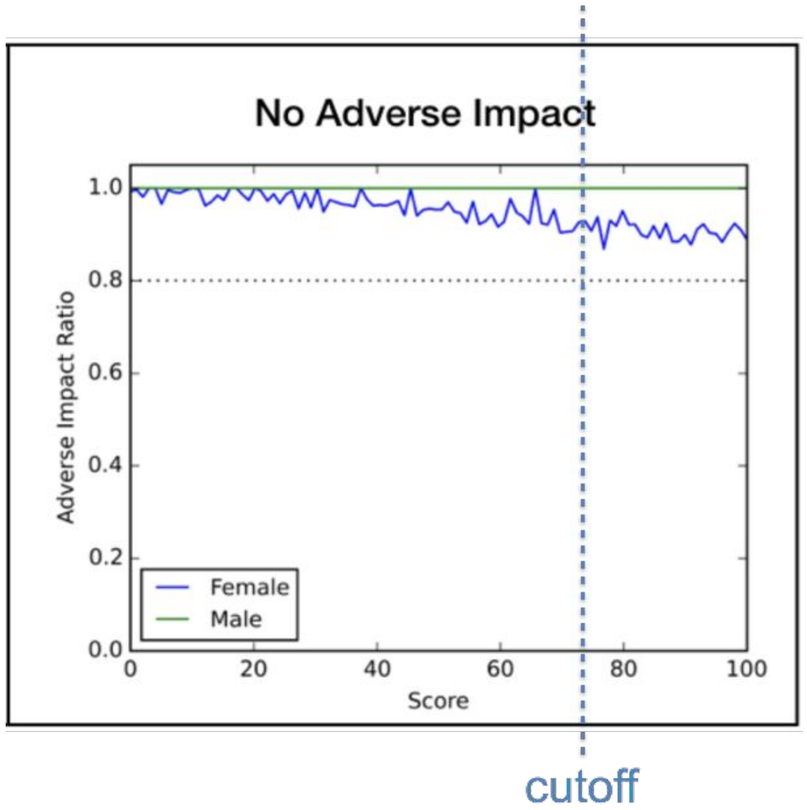
Feature1244

...

JOB ASSESSMENTS

AVOIDING ADVERSE IMPACT:

"THE 4/5^{THS} RULE"



AI FOR HIRING

BEST PRACTICES:

- Understand and control what features go into the model.
- Strive to use features that are not tightly tied to class.
- Strive to make the algorithm blind to age, race, and gender.
- Validate and test continuously.

AI FOR HIRING

CHALLENGES:

- Getting enough objective performance data.
- The 4/5ths Rule is not ideal for ranking.
- We cannot control human behavior.

AI FOR HIRING

CHALLENGES:

- Getting enough objective performance data.
- **The 4/5ths Rule is not ideal for ranking.**
- We cannot control human behavior.

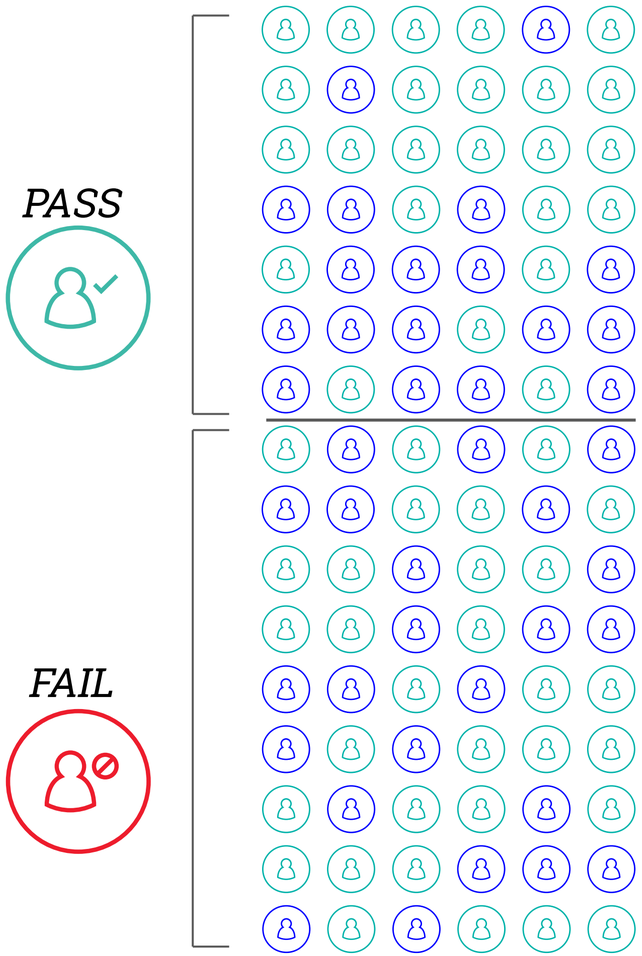
BEYOND THE 4/5THS RULE

- **Equalized Odds: We can satisfy the 4/5ths Rule at the cost/benefit of certain groups.**

- **In-class AUC**

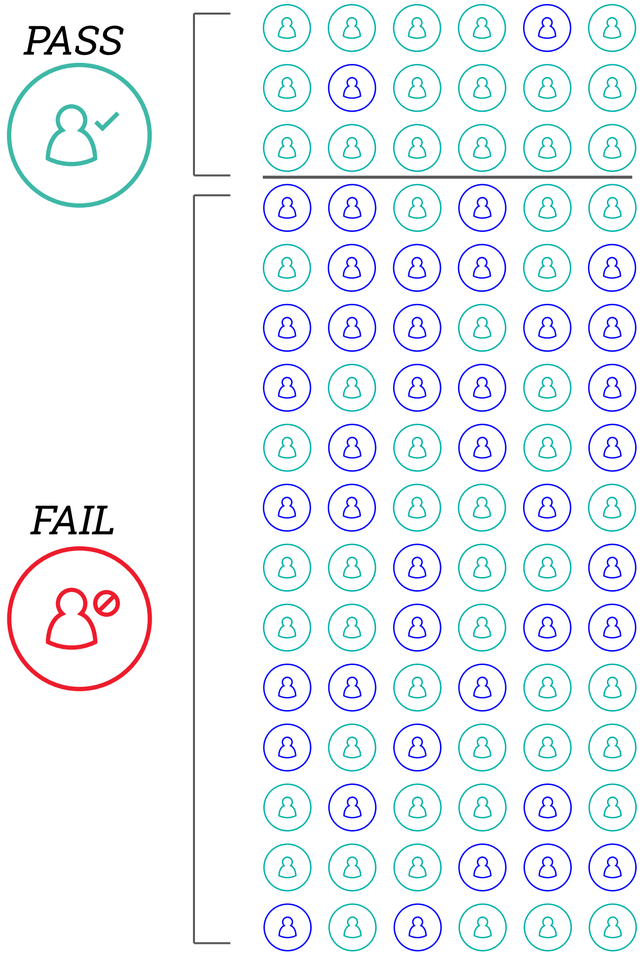
- **Group Distribution in the Ranking:**
  Proportion of in-group/out-group pairs where the in-group example is ranked higher.

ADVERSE IMPACT IN RANKING SCHEMES



Adverse Impact Cutoff
Passing rates are the same above this score cutoff.

ADVERSE IMPACT IN RANKING SCHEMES



Effective Cutoff
In practice, recruiters and hiring managers may be stopping here.

AI FOR HIRING

CHALLENGES:

- Getting enough objective performance data.

- The 4/5ths Rule is not ideal for ranking.

- **We cannot control human behavior.**
  - Evaluator Assignment
  - How do we understand and explain human decisions?

FUTURE DIRECTIONS

- Working fainess into model optimization at training time
- More powerful algorithms that are explainable
- Matching - More candidate-centric view
- Diversity of teams
- The rest of the hiring funnel - sourcing, recruiting, etc.

AI FOR HIRING

BIAS, AI ETHICS, AND THE HIREVUE APPROACH

https://www.hirevue.com/why-hirevue/ethical-ai

HIREVUE EXPERT ADVISORY BOARD

The HireVue Expert Advisory Board advises company leadership on key aspects of HireVue business and technology development, including AI ethics, algorithmic bias, diversity and inclusion, and data security and privacy.

HIREVUE EXPERT ADVISORY BOARD

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Prof. of Computing University of Utah

SHERYL FALK

Litigation Attorney, Winston & Strawn

MICHAEL CAMPION

Prof. of Management Purdue University

BEN TAYLOR

Co-Founder, Ziff.AI

Thank you