Emerging Technology

Wearables & Artificial intelligence

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Objectives

- Statistics & Types of Wearable Technology
- Research Studies, Pros vs. Cons and Cost and Investment
- Artificial Intelligence Examples/Integration
- Ethics of Technology/Artificial Intelligence
- Questions/Wrap-up

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Statistics & Types of Wearable Technology

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Wearable Technology Statistics

- The wearables market is growing rapidly, presenting new ways to engage with technology:
  - Smartwatches
  - Fitness trackers
  - VR
  - Hearables
  - GoPro
- The global wearable technology market generated about 289.89 million shipments in 2023.
- Projected industry growth at a CAGR: 17% in 2024-2032
  - Total value: ~1,190.24 million shipments by 2032.

iOS-Health

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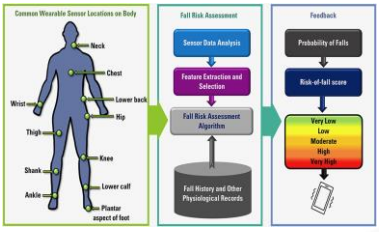
Types of Wearable Technology

IMU (Inertial Measurement Unit) Sensors

- Strong focus on manual material handling
- Haptic feedback (posture-based wearables)
  - Haptic response to inform users of unsafe movement or activity in real-time
  - Data is sent and stored in the platform (dashboard) for management review
  - Coaching, feedback and corrective Actions
- Other features:
  - Lumbar Risk Scoring
  - Repetitive Motion Alerts
  - Temperature Warnings
  - Forklift Driving (PIT Alert System)
  - Lone Worker Alerts



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Wearables - Dashboards

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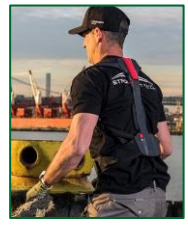
Wearable Technology Vendors (IMU/Physiological Sensors)

Kinetic

Swift Motion

StrongArm Technologies



MākuSafe

Modjoul

Smartbelt

dorsaVi

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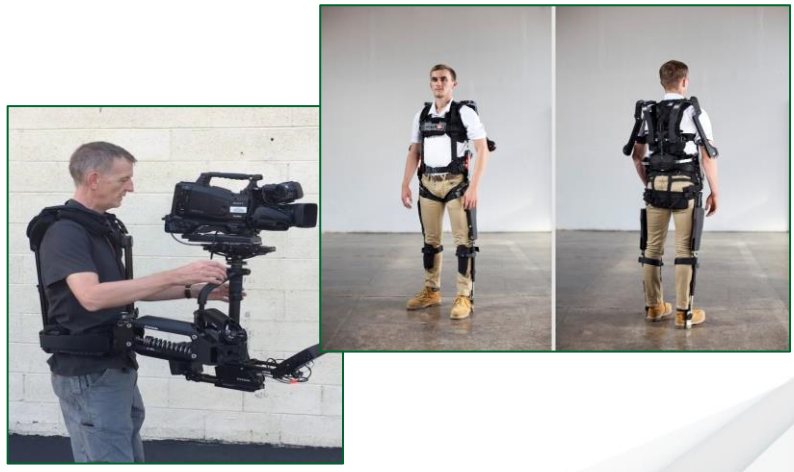
Types of Wearable Technology

Exoskeletons (Exosuits)

- Power (hydraulic) vs. Passive (springs)
- Body part(s) supported: Upper extremities
- Challenges: discomfort/transfers stress



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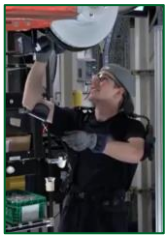
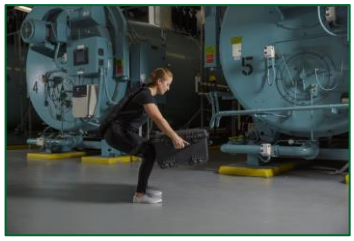
Exoskeletons/Exosuits

- Ekso Bionics
- Equipois
- Sarcos
- Levitate Technologies
- SuitX
- Wyss Institute at Harvard University
- Virginia Tech's partnership with Lowe's



Levitate Technologies

Sarcos



Wyss Institute

Virginia Tech & Lowe's

Ekso Bionics

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Research Studies, Pros & Cons, and Cost of Wearable Technology

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Research Study:

Field Assessment of an Arm-Supported Exoskeleton

Maury Nussbaum, Virginia Tech - Presented at the 2019 Applied Ergonomics Conference

- ✓ EksoVest (100 in a control group)
- ✓ 8 plants – elevated (overhead) assembly line
- ✓ Positive feedback from workers

Barriers at 6 Months:

- Thermal discomfort (22% reported)
- Range of motion restrictions (16%)
- Fit and adjustability (11%)
- Weight (9%)

Conclusions:

- Some benefits (reduced discomfort, increased performance)
- Some adverse effects (thermal, range of motion, fit)
- Impacts will take longer than six months

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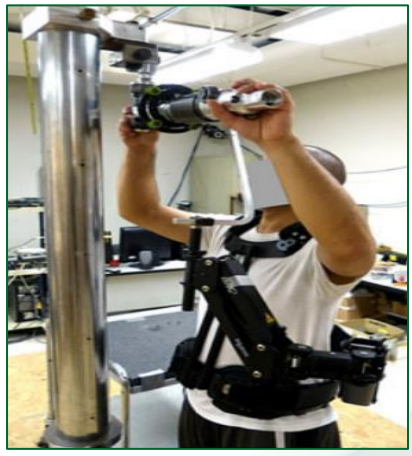
Research Study:

Assessing the influence of a passive, UE exoskeletal vest for tasks requiring arm elevation: Part 2 – "Unexpected" effects on shoulder motion, balance, and spine loading

Lee, et al., 2018, Applied Ergonomics 70

- 27 subjects (14 male,13 female)
- No participants reported any self-reported musculoskeletal injuries (over a 12-month period)
- Shoulder range of motion (10% less)
- Reduced postural control
- Slip & trip risk (minimal impact)
- Spine loading (reduced by up to 30%)



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Pros vs. Cons

PROS

- Drives rapid data results
- Generates detailed, specific data to help build business cases:
  - ✓ Return on Investments (ROI)
  - ✓ Critical patterns and trends (departments and specific areas)
- Creates a promising job risk analysis, evaluation, or assessment
- Enhances employee wellness programs

CONS

- Employee distractions (haptic feedback)
- Adverse reactions
  - (comfort, range of motion, etc.)
- Data security and privacy breaches
- Over-trust or under-trust
- Negative safety culture
  - Employee blame vs. coaching
- Financial and time management commitments

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Costs and Investment for Wearables

IMU/Physiological Sensors
Minimum Order Requirements

- **Pilot Stage** (~$5K – $10K)
- **Full Rollout** (~up to $50K or higher)

Exoskeletons/Exosuits
Minimum Order Requirements

- **Pilot Stage** (~$10K – $20K for passive exosuits)
- **Full Rollout** (~up to $100K or higher)

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Integrating AI into Workplace Safety

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AI and Tech:
How are you using it?

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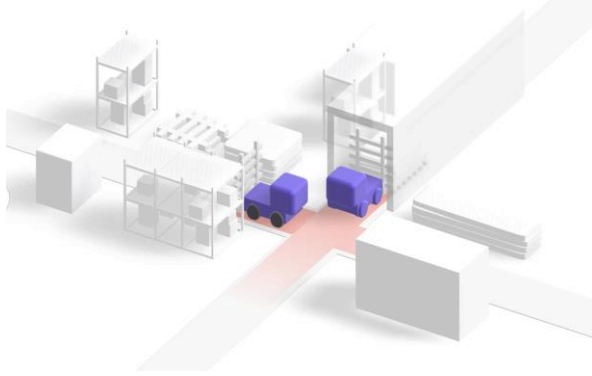
Artificial Intelligence Products

- **Plug and play installation**
- **Some products can connect to existing cameras**
- **Detects risks in real-time**
- **Transmits to manager dashboard**



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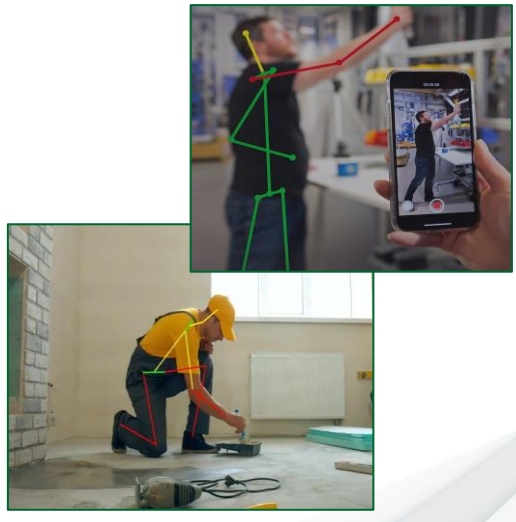
Ergonomic Applications

Artificial Intelligence (Ergo Apps)

- Easy-to-use ergonomic applications
- Manual material handling exposures
- Ergonomic methods/tools
- Alternative and a cost-effective approach
- Beneficial for safety and ergonomic committees
- Highly validated and researched-based methods and tools

https://www.voxelai.com/platform

https://www.intenseye.com/



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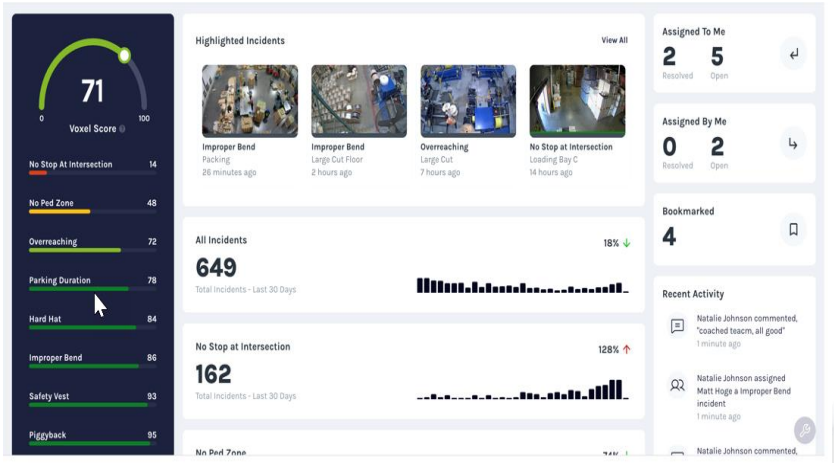
AI Product Example and Dashboard

Ergonomics

PIT Safety

PPE



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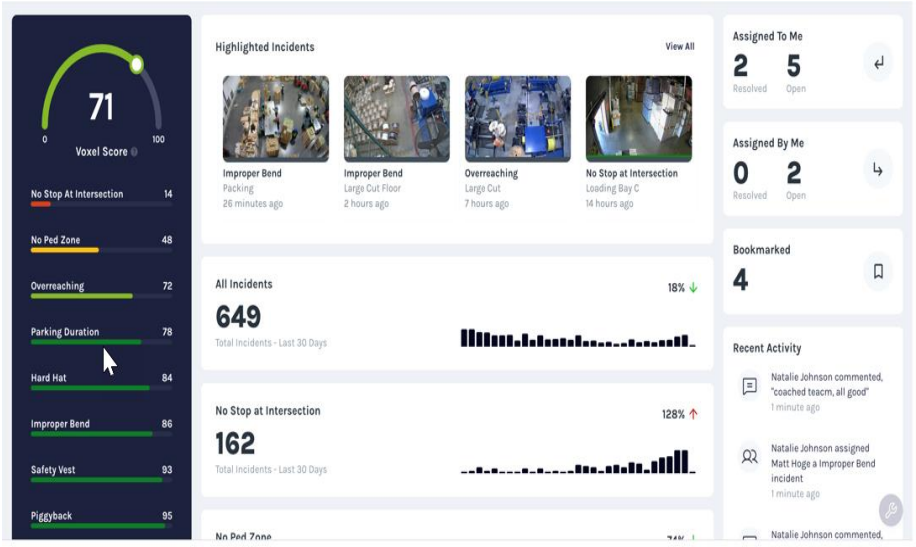
AI Dashboard Preview



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Artificial Intelligence Product Examples

60' Aisle Visibility

Lower Navigation Camera

- Store Mapping
  Environment learning and navigation
  - Full 3D mapping
  - Scan to map in 2-3 Hours
- Robot Monitoring
  Remote fleet management and troubleshooting
  - Alert-based control software
  - Full visibility to all robots in fleet
  - Monitoring, remote control, and diagnostics
- Continuous Operation with 99% Up Time
  - Programmed to continuously scour aisles for hazards up to 12 hours a day between charges
  - Accurate records stored in the cloud (including pictures and timestamps)
  - Automated notification and guest warning for extra safety
- Real-Time Reporting
  - Every incident recorded and saved for future review
  - Track store performance and manage KPIs

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Costs and Investment for AI

Artificial Intelligence (Ergo Apps)
Monthly and Annual Costs

- **Monthly Costs** (~$500 to $800)
- **Annual Costs** (~$6K to $10K)

Artificial Intelligence (Other Technology)
Advanced

- **Pilot Stage** (~$60K to $80K)
- **Full Rollout** (~$120K or higher)

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AI and Risk – Safety – Safety Program Development

Large Language Models (LLMs)

- ChatGPT and Perplexity AI are common

Notable examples:

- Content Creation and Management (Policies, procedures, and big data)
- Training and communication materials (PPT, safety blogs, articles, toolbox talks)
- Regulatory Compliance (research)
- Complex risk and loss analysis
- Risk Assessment
- Emergency Preparedness
- Incident Investigation
- Personal Protective Equipment (PPE)
- Employee Engagement

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Let's Try Some **Prompts**

https://chat.openai.com/

https://www.perplexity.ai/

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Simple starter question

Can you give me some ideas on how I can use Perplexity AI to build and manage my workplace safety program?

Can you give me some ideas on how I can use ChatGPT to build and manage my workplace safety program?

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I am a workplace safety professional with 2 years' experience. I have started a new job as a safety manager at a multi-location manufacturing company and will need a detailed action plan to build a robust safety program.

You are a world-class safety professional using the techniques found in Kevin Burns book, PeopleWork: The Human Touch in Workplace Safety. Your job will be to help and coach a new safety manager to build a robust safety program.

Create a plan to prepare a new safety manager for their first safety management job. The plan should include a step-by-step plan to build a robust safety program at their new company.

1. Context, Goal, Output

2. Role, Task, Instructions

3. Chain of Thought

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7 Dangers Associated With Large Language Models

1. Lack of Industry-Specific Expertise or Practical Experience
2. Limited Context Understanding
3. Risk of Inaccurate Information
4. Absence of “Legal” Advice
5. Potential Bias in Training Materials
6. Dynamic Nature of Safety Standards
7. Inability to Provide Site-Specific Advice

One more additional DANGER!

https://www.youtube.com/watch?v=OMOGaugKpzs

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What About Ethics?

Should we care?

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Ethics and Workplace Safety

1. Human Wellbeing
2. Fairness and Equality
3. Transparency
4. Accountability
5. Data Privacy
6. User Involvement and Consent
7. Long-term Trust
8. Mitigating Unintended Consequences
9. Compliance with Regulations
10. Corporate Reputation

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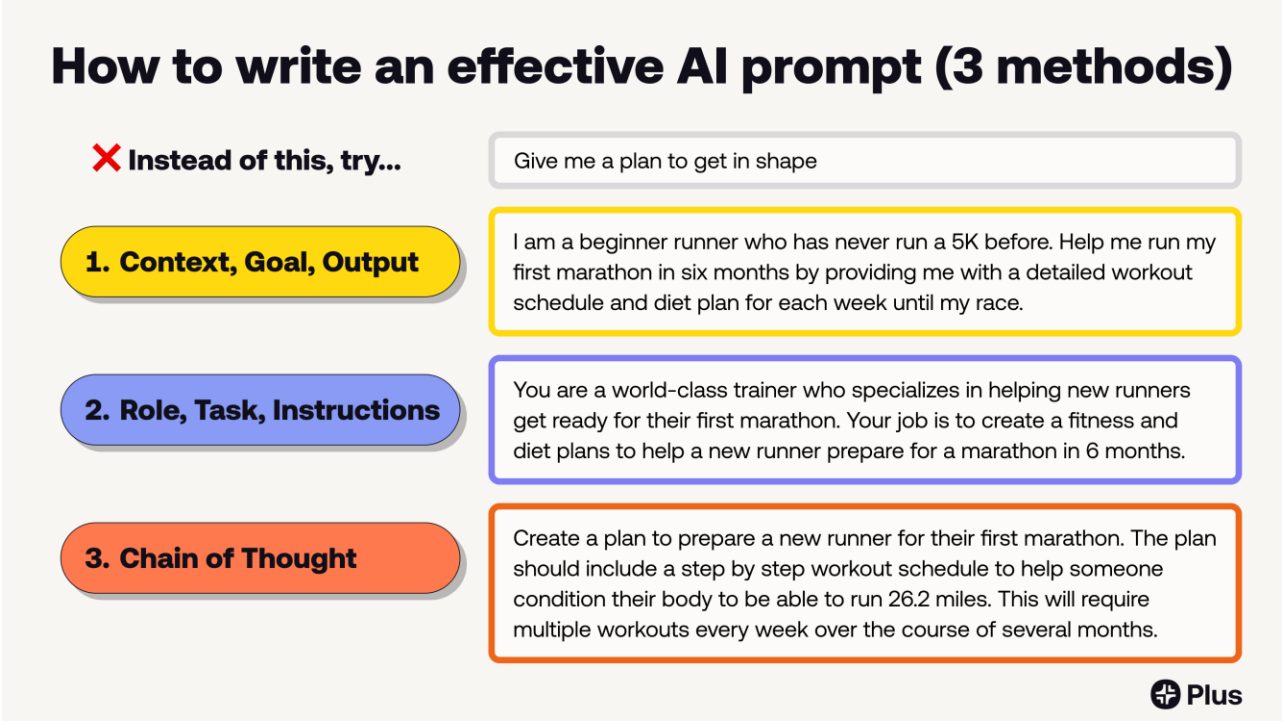
How to write an effective AI prompt (3 methods)
❌ Instead of this, try...
Give me a plan to get in shape
1. Context, Goal, Output
I am a beginner runner who has never run a 5K before. Help me run my first marathon in six months by providing me with a detailed workout schedule and diet plan for each week until my race.
2. Role, Task, Instructions
You are a world-class trainer who specializes in helping new runners get ready for their first marathon. Your job is to create a fitness and diet plans to help a new runner prepare for a marathon in 6 months.
3. Chain of Thought
Create a plan to prepare a new runner for their first marathon. The plan should include a step by step workout schedule to help someone condition their body to be able to run 26.2 miles. This will require multiple workouts every week over the course of several months.
Plus

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