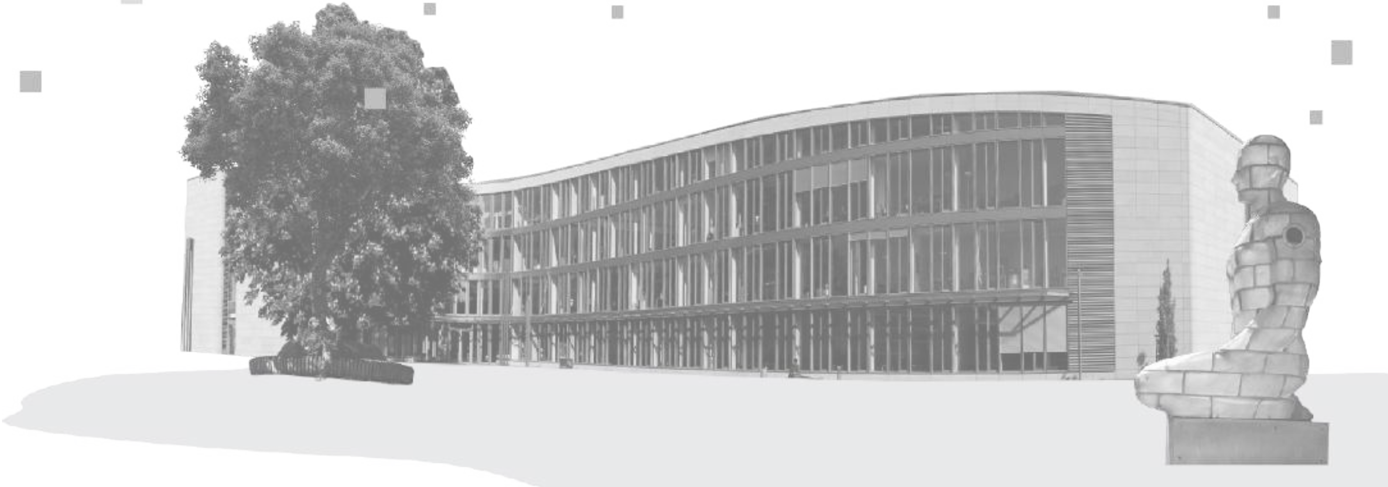
Ring Commercial, Super Bowl 2026

Hasso Plattner Institut
Digital Engineering · Universität Potsdam

Biometric Surveillance & AI

Responsibility in Computer Science

Georg Auge



**Design IT.
Create Knowledge.**

www.hpi.de

Biometrics

Biometric features include (but are not limited to):

- **Fingerprints**
- **Facial Features**
- **Voice Patterns**
- **DNA**
- **Movement Analysis**
- **... and others**

Soft biometrics

Physical	Behavioral	Adhere human characteristics
• skin colour • eye colour • hair colour • presence of beard or moustache • height • weight • gender • race • ethnicity • wrinkles	• gait • keystroke • signature	• clothes color • tattoos • accessories

Biometric Surveillance

- Systems for capturing and analyzing biometric data
- Use cases include:
  - identification,
  - tracking
  - and monitoring individuals
- Widely used for decades

Why ✨ AI ✨?

Biometrics & AI
Example: Facial Recognition

Traditional Methods

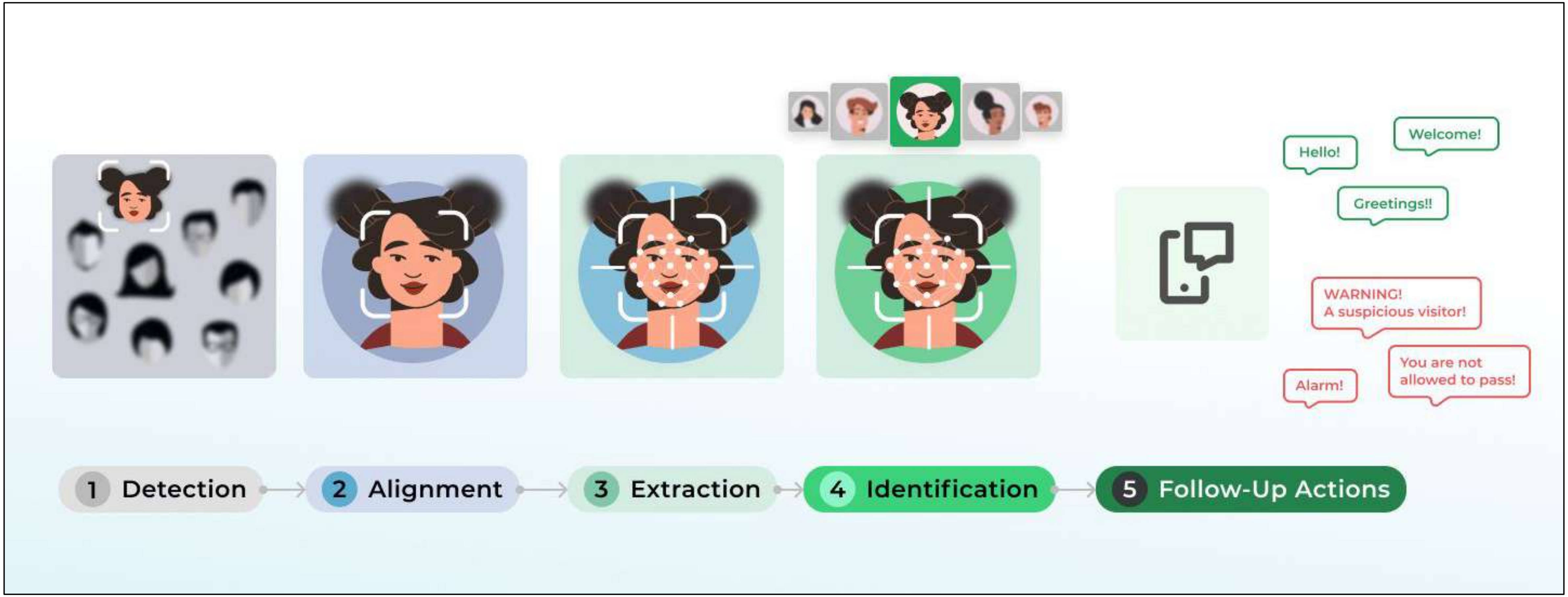
Geometric & Statistical Approach

- Manual feature engineering: measuring distances between eyes, nose, and mouth.
- Highly sensitive to lighting conditions and head orientation.
- Limited database scalability; matching was computationally expensive and slow.
- Hardcoded algorithms struggled with aging or facial hair.

AI-Based Facial Recognition

?

AI-based Facial Recognition



Source: https://mobidev.biz/blog/how-build-face-recognition-system-integrate-into-app

Biometrics & AI
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AI-Based Facial Recognition

Deep Learning & Neural Networks

- **Massive Accuracy Boost:** Also drastically increased speed and ease-of-use.
- **Robust Feature Extraction:** Handles varying lighting, angles, and occlusions automatically.
- **Real-Time Processing:** Capable of analyzing video data in near real-time for tracking.
- **Biometric Synthesis:** Can combine with soft biometrics (gait, skin color) for higher precision.

Paper source

Ethical Considerations and Legal Frameworks for Biometric Surveillance Systems: The Intersection of AI, Soft Biometrics, and Human Surveillance

by Punia et. al, 2024

- Survey paper
- Provides overview of biometric surveillance systems
- Highlights benefits
- Explores ethical implications
- Compares legal regulations in different countries/regions

Advantages of biometrics (& surveillance)

Speed & Accuracy

High precision in rapid individual identification.

Enhanced Security

Robust fraud prevention through unique biological markers.

Process Efficiency

Streamlined identity verification workflows.

Real-Time Tracking

Ability to monitor individuals instantly in active environments.

What concerns do you have with biometric surveillance?

Broader concerns

Privacy

Consent

Data Protection

Discrimination

Misuse of Personal Information

Cameras have quietly appeared in thousands of US cities – now, their integration with AI is sounding alarms

Published: March 27, 2026 8.25am EDT   Updated: March 27, 2026 5.29pm EDT

A small, black license plate recognition camera is mounted on a light pole in Boulder, Colo. Matthew Jonas/MediaNews Group/Boulder Daily Camera via Getty Images

For decades, cars dictated urban planning in the United States.

Few could have predicted that they would one day also double as nodes for surveillance.

Author

Jess Reia
Assistant Professor of Data Science, University of Virginia

FBI seeks US-wide access to license plate cameras, wants “data in near real time”

FBI will pay vendors to help it track and search for vehicles nationwide.

JON BRODKIN – 19. MAI 2026 23:29 | 172

Ausbau von Videoüberwachung

Mehr Kameras und KI gegen Straftaten – das sind die Pläne

Quelle: dpa Hessen 15. April 2026, 13:24 Uhr

Flock cameras in US cities

- The deal:
  - Cheap (or free) cameras
  - Subscription contract and ***data rights***
- Contracts with more than 6000+ communities
- Scan >20 billion license plates per month
- Builds national surveillance network
- Allows federal agencies (e.g. ICE) data access
- Announced partnership with Ring, has since been cancelled over backlash

Legal Frameworks Around the World

EU 🇪🇺

- **General Data Protection Regulation (GDPR)**
- **guidelines for the collection, processing, and storage of biometric data**
- **emphasizes**
  - informed consent
  - data security measures
  - providing rights over personal information

USA 🇺🇸

- **varies at state and federal level**
- **Illinois**
  - Biometric Information Privacy Act (BIPA)
- **California**
  - California Consumer Privacy Act (CCPA)

Others 🌍

- **France**
  - stricter laws on top of GDPR
- **Japan**
  - strict rules via APPI
- **India**
  - uses national identification system
  - includes biometric data
  - special regulation

Challenges in Regulation

HPI

Previously Highlighted Concerns

Existing issues remain central to the regulatory debate.

- Privacy protection
- Bias and discrimination mitigation
- Responsibility and accountability

Security Interests

Balancing individual rights with collective safety needs.

- Surveillance state concerns
- Critical infrastructure protection

Rapidly Evolving Technologies

The pace of innovation often outstrips legislative processes.

- Lagging legal frameworks
- Unforeseen technical applications

Recommendations for Ethical & Legal Frameworks

Privacy-Preserving Approaches

Implement privacy by design in biometric surveillance systems to protect individual rights while maintaining security.

Informed Consent & Transparency

Strengthen measures to ensure clear communication and meaningful consent from individuals interacting with AI systems.

Address Bias & Discrimination

Proactively audit and mitigate algorithmic biases to prevent discriminatory outcomes in automated decision-making.

Adaptive Legal Frameworks

Evolve legal structures to keep pace with rapid technological advancements and emerging ethical challenges.

Best Practices for AI System Development

1. Privacy by Design

Embed protection from the start.

- Minimize data collection
- Strong security measures
- User control over data

2. Ethical AI Development

Adhere to vital ethical standards.

- Diverse training datasets
- Regular bias auditing
- Address emerging concerns

3. Stakeholder Engagement

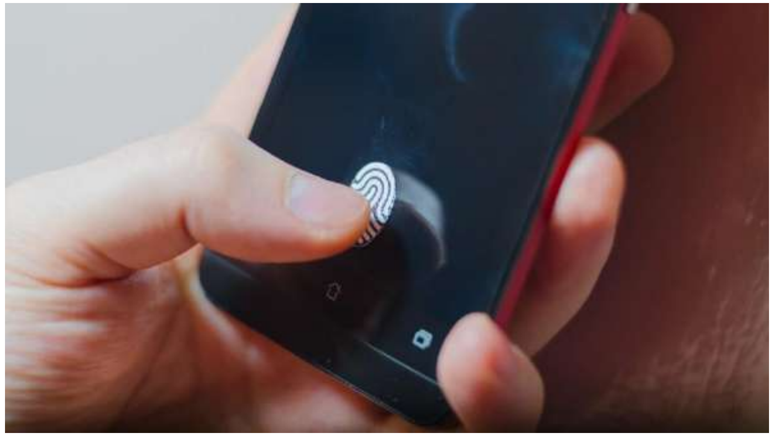
Promote collective oversight.

- Engage civil society
- Transparency & accountability
- Inclusivity in design

Conclusion

Benefits	Concerns & Challenges
• faster & better identification • enhanced security • improved customer experience	• protection of individual privacy • prevention of discrimination • preservation of fundamental human rights • rapidly evolving technologies • continuous adaptation of legal frameworks

Discussion



Do you NOT use biometrics with your personal devices? If so, why not?

Do public surveillance cameras contribute to your feeling of safety?

What are other situations, in which you are willing to give up your privacy?

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