

WHITE PAPER

Seeing Hazards Before People Fall

An AI Computer Vision Approach to Real Time Wet Floor and Spill Detection for Small and Medium Sized Businesses

Aligned with OSHA Walking and Working Surface Standards and NIST SP 800-53 Security and Privacy Controls

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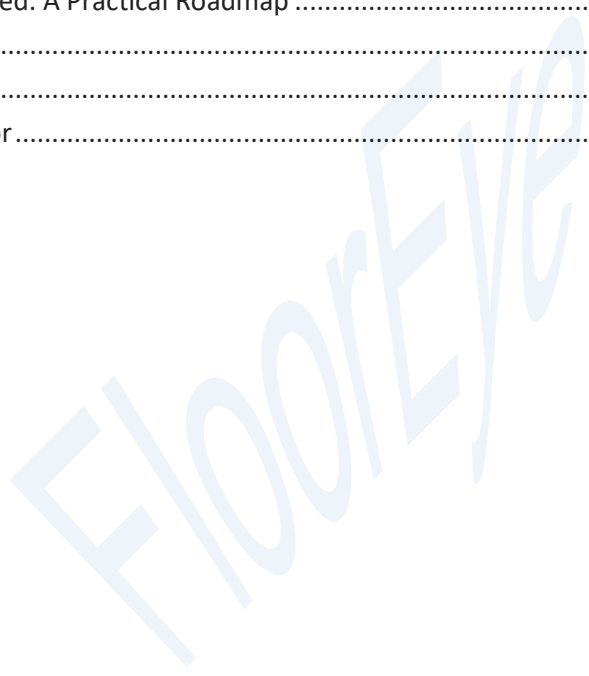
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Executive Summary

Spend enough time in any busy store, kitchen, or warehouse and you will eventually come across a wet floor that nobody has noticed yet. Maybe a cooler dripped overnight, or a customer tracked in rain, or a tray of drinks went over during the lunch rush. Nothing about it looks dramatic, which is the problem. The hazard just sits there for a few seconds or a few minutes, and somewhere in that window a person slips.

Falls like these are among the most common workplace injuries, and also among the most preventable, and they hit smaller businesses hardest. A national chain absorbs the claim, tops up its reserves, and moves on. A single restaurant or a family grocery usually cannot do that. One bad fall can bring a lawsuit, higher premiums, an OSHA citation, and weeks of disruption, and the spill that caused it may have taken ten seconds to form.

What is actually missing is time. The caution sign, the mat, the mop round, the incident report, every standard tool waits for a person to notice the hazard first. FloorEye was built to close that gap. It watches floor areas through the cameras a business already owns, recognizes a wet floor or a spill as soon as it appears, and alerts staff within seconds, early enough for someone to clean the area or cone it off before anyone walks into it.

Two established frameworks run through this paper. One is OSHA's set of rules for walking and working surfaces, anchored by 29 CFR 1910.22 and the General Duty Clause, which expect employers to keep floors clean and dry as far as is feasible and to fix hazards promptly. The other is NIST Special Publication 800-53, the federal catalog of security and privacy controls, which FloorEye treats as a design reference so that watching a floor for hazards does not turn into a new privacy problem.

For a small or medium sized business the case is a practical one. A detection layer of this kind helps prevent injuries, lowers liability, and quietly builds the time stamped record that insurers and regulators increasingly want to see, without adding anyone to the payroll. The pages that follow lay out how large the problem really is, what the law requires, how FloorEye works and protects privacy, and what the approach looks like in four industries where smaller businesses carry the most risk: retail and grocery, restaurants and food service, warehousing and logistics, and healthcare and senior care.

1. Introduction: The Hazard Hiding in Plain Sight

Every business with a floor has a floor safety problem, and most do not find out how big it is until someone gets hurt. A wet floor is not like a fire or a broken machine. It does not announce itself. A spill makes no sound, a leak spreads slowly, and rain comes in on a customer's shoes. Often only a few seconds pass between a hazard forming and a person reaching it, which is faster than any mop round, posted sign, or busy employee glancing in the right direction can cover.

For decades the tools for managing this risk have been static and reactive: caution signs, floor mats, scheduled mopping, incident reports written after the fall. Each has its place. None of them, though, sees the hazard at the moment it appears, and that shared blind spot accounts for a large share of the injuries, claims, and lawsuits that follow.

It is now possible to do something about that. Computer vision and edge computing have reached the point where an ordinary security camera can be taught to recognize a wet floor or a spill in real time and tell someone right away. For a small or medium sized business, facing the same hazards as a large company on a fraction of the staff and budget, that is the difference between reacting to incidents and preventing them.

2. The Scale of the Problem

By every major national measure, falls sit at or near the top of the workplace injury statistics. The U.S. Bureau of Labor Statistics counted 844 fatal falls, slips, and trips on the job in 2024. On the nonfatal side, falls on the same level produced more than 405,000 cases serious enough to require days away from work, a job restriction, or a transfer across the 2023 and 2024 survey years, the most recent period for which BLS has published detailed case data. More than 264,000 of those cases cost workers days away from work outright [1][2].

The cost figures point the same direction. Liberty Mutual's 2025 Workplace Safety Index ranks falls on the same level as the second costliest cause of disabling workplace injury, at about \$10.5 billion a year in direct employer costs out of the \$58.78 billion that the top ten injury causes drain from American businesses annually [3]. The National Floor Safety Institute puts the combined cost of slips and falls, once lost productivity and medical bills are added in, somewhere around \$70 billion a year, and ranks them among the leading drivers of workers compensation claims [4]. OSHA, for its part, notes that employers pay roughly \$1 billion a week in direct workers compensation costs across all injury types [10].

Measure	Figure	Source
Fatal falls, slips, and trips on the job (2024)	844 fatalities	BLS [1]
Same level falls, serious cases away, restricted, or transferred (2023 to 2024)	More than 405,000 cases	BLS [1]
Same level falls, annual direct employer cost	About \$10.5 billion	Liberty Mutual [3]
Combined annual cost of slips and falls to business	About \$70 billion	NFSI [4]
Employer direct workers compensation spending, all injuries	About \$1 billion per week	OSHA [10]

Behind the totals sit the everyday realities of particular industries. The National Floor Safety Institute reports that several million food service workers and more than a million restaurant guests are hurt in slips and falls every year. In retail and grocery, where staff and customers share the same crowded floors, a single fall can turn into a premises liability claim. Reported settlements in grocery slip and fall cases commonly run from about \$10,000 to \$50,000 and climb well past \$100,000 when the injury is serious [4]. One event like that can wipe out a small operator's profit for the year.

3. Why Small and Medium Sized Businesses Are Disproportionately Exposed

This exposure is national in scale. The U.S. Small Business Administration's Office of Advocacy counts more than 36 million small businesses in the United States, employing nearly 46 percent of the private sector workforce, over 61 million people, across every state and nearly every industry [12]. Most of the country's storefronts, kitchens, clinics, and warehouses are run by small employers, so how they handle something as ordinary as a wet floor ends up being a question of national workplace safety rather than just individual risk.

A large company usually has safety professionals on staff, formal inspection programs, and either self insurance or strong negotiated coverage. Small and medium sized businesses rarely have any of that, yet they run the same slippery floors, serve the same customers, and answer to the same regulators. Three factors in particular push floor safety risk onto smaller employers.

- **Thin safety staffing.** In a small store, restaurant, or warehouse, floor safety is one more task piled on people who are already serving customers, cooking, or moving stock. Watching every floor all the time is simply not possible on headcount alone.
- **Tight margins, big shocks.** A single recordable injury can raise premiums, trigger legal bills, and disrupt operations. With employers paying around \$1 billion a week in direct workers compensation costs, one serious incident can destabilize a small business [10].
- **Limited awareness of obligations and help.** Many small employers are unsure which OSHA rules apply to them, and many have never heard of free resources such as OSHA's On Site Consultation Program. The compliance burden is real even where support exists [10].

What results is a coverage gap: the businesses least able to watch their floors continuously are the ones most exposed when they do not. Technology that monitors constantly without adding headcount is worth the most in exactly the places where it has always been hardest to get.

4. The Regulatory Landscape: What Employers Are Required to Do

4.1 OSHA Walking and Working Surfaces (29 CFR 1910.22)

OSHA's general industry standard for walking and working surfaces, 29 CFR 1910.22 within Subpart D, sets the baseline for the floors employees use. Employers must keep workplaces clean, orderly, and sanitary; keep floors clean and, so far as is feasible, dry; provide drainage, false floors, platforms, or mats where wet work is done; keep surfaces free of hazards such as spills, leaks, snow, and ice; and inspect surfaces regularly, fixing hazardous conditions before an employee uses the surface again [5][6].

Two phrases in that rule quietly assume something important. So far as is feasible, and before an employee uses the surface again, both take it for granted that the employer already knows the hazard exists. That knowledge is precisely what occasional, manual observation struggles to deliver in real time.

4.2 The General Duty Clause

Beyond the specific standards, Section 5(a)(1) of the Occupational Safety and Health Act, known as the General Duty Clause, requires every covered employer to provide a workplace free of recognized hazards likely to cause death or serious harm. Slip and fall hazards are well recognized, so employers are expected to take reasonable steps to find and fix them even when no single standard spells out every detail [7].

4.3 The Cost of Getting It Wrong

Federal law requires OSHA to adjust its civil penalties for inflation. As of 2026 the maximum penalty for a serious or other than serious violation is \$16,550, and the maximum for a willful or repeated violation is \$165,514, with a floor of \$11,524 for a willful violation [8][9]. Those figures come on top of the workers compensation, medical, legal, and reputational costs that follow an actual injury.

Violation type (2026)	Maximum penalty per violation
Serious or other than serious	\$16,550
Willful or repeated	\$165,514 (minimum \$11,524 for willful)
Failure to abate	\$16,550 per day past the deadline

Avoiding penalties is only part of the picture, because being able to show diligence matters just as much. When an incident or an inspection happens, an employer who can produce a time stamped record of when a hazard was found and how quickly it was handled stands on much firmer ground than one relying on memory and a paper log. As Section 6 describes, an automated detection system generates that record as a normal part of its work.

5. Why Current Approaches Fall Short

Traditional floor safety measures are necessary, but they are incomplete. Each handles one piece of the problem while leaving the critical detection gap open.

Approach	What it does well	Where it falls short
Warning signs and cones	Alerts people to a known hazard	Someone must already know about the spill and place the sign
Floor mats and drainage	Reduces water at entrances and wet areas	Does nothing about spills elsewhere
Scheduled inspection rounds	Creates routine and accountability	Hazards appear between rounds, so coverage is intermittent
Incident reports	Captures data after the fact	Reactive, the injury has already happened
General purpose CCTV	Records footage for later review	Passive, no one watches every frame in real time

The thread running through all of these is timing. Every traditional measure waits for a human to notice the hazard first, and the few seconds or minutes before that happens are when most slip and fall injuries occur. Closing that window takes continuous, automated detection, something that has only recently become affordable for smaller businesses as computer vision and edge computing have matured.

6. The FloorEye Approach

FloorEye adds an always on detection layer to the cameras a business already runs. Rather than storing footage for later review, it reads the live feed, recognizes wet floors and spills as they form, and notifies the right people immediately so the hazard can be dealt with before anyone is hurt. The design comes down to four ideas.

6.1 Real Time Detection, Not Retrospective Review

FloorEye's computer vision models watch floor areas continuously for the visual signature of standing liquid: the reflectivity, the spreading edges, the change in texture that separates a spill from a dry surface. The goal is to cut the time between hazard and awareness from minutes down to seconds. The broader field is moving the same way, with vision systems increasingly used to catch slip and trip hazards, falls, and other unsafe conditions in real time, and the market for computer vision technology projected to grow sharply through the rest of the decade [13].

6.2 Edge First Processing

Where it can, FloorEye runs its analysis at the edge, on local hardware near the cameras, instead of streaming raw video to the cloud. Edge processing keeps latency low so alerts arrive fast, cuts bandwidth and dependence on connectivity, and limits how much sensitive video ever leaves the building. As Section 8 explains, this is also central to the privacy and security posture.

6.3 Immediate, Actionable Alerts

Detection is only useful if it reaches the right person in time. FloorEye sends alerts to on site staff through the channels they already use, so a detected spill turns into a cleanup task within seconds rather than sitting unnoticed. Each alert says where the hazard is, and staff can go straight to it.

6.4 An Automatic Audit Trail

Every detection and response can be logged with a time stamp, which builds up a running record of when hazards appeared and how quickly they were cleared. For a small business this turns compliance from a paperwork chore into a byproduct of normal operations: the same system that prevents injuries also documents the diligence that OSHA, insurers, and, if it ever comes to it, a court will want to see. FloorEye remains a detection aid for staff. It supports good housekeeping and human judgment rather than replacing either.

7. Sector Playbooks

The floor safety problem looks different in every industry. The profiles below show how a real time detection layer fits four sectors where smaller businesses carry the most risk.

7.1 Retail and Grocery

Supermarkets and retail stores combine heavy customer traffic with frequent liquid hazards: leaking refrigeration cases, dropped jars, produce misting runoff, and rainwater at entrances. Because customers are exposed, not just employees, the liability profile is high and premises liability claims are common. Real time detection at refrigeration aisles, entrances, and beverage sections lets staff respond before a shopper reaches the hazard, and the resulting time stamped log becomes useful evidence of reasonable care if a claim is filed later [4].

7.2 Restaurants and Food Service

Kitchens and dining rooms produce water, grease, oil, and dropped food throughout service. The National Floor Safety Institute reports that millions of food service workers and more than a million guests are hurt in slips and falls each year. Monitoring kitchen lines, dish stations, drink stations, and the paths between kitchen and dining room helps catch grease and water hazards during the rush, when staff are least able to watch the floor [4].

7.3 Warehousing and Logistics

Loading docks, aisles, and staging areas collect water from doors and weather, leaks from equipment and pallets, and condensation in temperature controlled zones. Those spaces are often shared with forklifts and pallet jacks, where a fall can have severe consequences. Detection aimed at dock doors, battery charging areas, and main travel aisles supports both worker safety and the housekeeping requirements of 29 CFR 1910.22 [5][6].

7.4 Healthcare and Senior Care Facilities

Clinics, outpatient centers, and senior living facilities serve people for whom a fall is far more likely to cause serious, lasting injury. Hazards include spills in corridors and dining areas, restroom and entryway water, and fluids near care stations. Real time detection in corridors, common areas, and entrances adds a layer of protection for residents, patients, and staff alike, with the privacy safeguards described in Section 8 that matter especially in care settings.

8. Security and Privacy by Design: Alignment with NIST SP 800-53

Any system that processes video in spaces used by employees and customers has to treat security and privacy as core requirements, not afterthoughts. FloorEye approaches this using the language of NIST Special Publication 800-53, Revision 5, the U.S. government's catalog of security and privacy controls. Revision 5 organizes roughly a thousand controls into twenty families, and it added a dedicated family for Personally Identifiable Information Processing and Transparency, and one for Supply Chain Risk Management, which reflects how seriously modern frameworks now treat privacy and third party risk [11].

FloorEye does not claim a formal government accreditation. It uses SP 800-53 as a design reference so that its data handling holds up to scrutiny. The table below maps several relevant control families to concrete FloorEye design choices.

NIST 800-53 family	Relevance to a vision safety system	FloorEye design intent
AC, Access Control	Limit who can view video and system data	Role based access, least privilege accounts, footage restricted to authorized staff
AU, Audit and Accountability	Record who did what, and when	Time stamped detection and response logs, plus logging of administrative actions
SC, System and Communications Protection	Protect data in transit and at rest	Encryption of data in transit and at rest, with edge processing that keeps video on the premises
SI, System and Information Integrity	Keep the system trustworthy and patched	Monitoring, integrity checks, and timely updates
PT, PII Processing and Transparency	Handle imagery of people responsibly	Data minimization, aimed at detecting hazards rather than identifying individuals
CM, IA, IR, RA	Configuration, identity, incident response, risk	Hardened configuration, authenticated access, a defined incident response plan, and ongoing risk assessment

Most of the work is done by two design choices. Edge first processing means the system exists to detect a condition on the floor, not to build a record of individuals, and keeping the analysis local limits how much identifiable imagery ever moves or is retained. Data minimization and access control then make sure that whatever is kept stays limited, encrypted, and visible only to those who need it. Together they strengthen physical safety without creating an outsized privacy or cybersecurity exposure, a balance that matters most in healthcare, education, and any setting that serves vulnerable people [11].

9. The Business Case for SMBs

For a small or medium sized business, the value of real time floor hazard detection shows up in four ways.

- 1. Injury prevention.** The most important return is the injury that never happens. Preventing even one serious fall avoids the human harm and the chain of direct and indirect costs that follow it, from workers compensation and legal expenses to lost time and higher premiums [3][4][10].
- 2. Lower liability and evidence of care.** Faster hazard response reduces the chance of a claim, and the time stamped logs provide contemporaneous evidence that the business acted reasonably, a real advantage in premises liability disputes [4].
- 3. Compliance support.** Continuous monitoring and automatic documentation line up directly with OSHA's expectations under 1910.22 and the General Duty Clause, and they help a business avoid

penalties that start at \$16,550 per serious violation. OSHA's own Safety Pays materials show how injury costs eat into profit and how prevention pays off [5][7][8][10].

- 4. Operational and insurance benefits.** Fewer incidents can mean less downtime, fewer disruptions, and a stronger safety record, all of which increasingly affect insurance terms. A documented, technology backed safety program signals lower risk to carriers.

Because FloorEye builds on existing cameras and edge hardware, it is meant to deliver this protection without the dedicated safety headcount that has long kept continuous monitoring out of reach for smaller operators.

10. Getting Started: A Practical Roadmap

Adopting real time floor hazard detection does not have to be a large project. For most small businesses a practical rollout looks like five steps.

- 1. Map the high risk zones.** Identify the floor areas where spills are frequent and traffic is heavy: entrances, refrigeration aisles, kitchen lines, dish and drink stations, dock doors, and corridors.
- 2. Use the cameras you already have.** Confirm that current cameras cover those zones, then add or reposition only where needed.
- 3. Configure detection and alerts.** Decide which areas to monitor and how staff should be notified, fitting the alert flow to routines that already exist.
- 4. Pilot, then expand.** Start with the highest risk zone or a single location, confirm that detection and response work well, then extend coverage.
- 5. Use the data.** Review the detection and response logs to find recurring hazard patterns, target prevention, and keep compliance documentation current.

11. Conclusion

Slips, trips, and falls are common, costly, and largely preventable. The barrier was never awareness, since everyone already knows wet floors are dangerous. It was the lack of a practical way to know about a hazard the moment it appears. That gap has been hardest on small and medium sized businesses, which face the same risks as large companies without the staff or budget to watch every floor every minute.

Modern computer vision changes that math. By turning ordinary cameras into an always on detection layer that recognizes spills in real time and alerts staff at once, FloorEye helps smaller businesses prevent injuries, lower their liability, and document the diligence that regulators and insurers expect, all while respecting privacy and security through an edge first design built around NIST SP 800-53. The technology to see hazards before people fall exists and is within reach. The sensible time for a small business to adopt it is before the next preventable injury, not after.

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About the Author

Junaid A Shah is the founder and inventor behind FloorEye. He has spent more than seven years in technology, working across artificial intelligence, data engineering, and software development, and he builds AI and computer vision systems that turn the cameras a business already owns into intelligent, always on safety sensors. He holds a Master of Science in Business Analytics and a Bachelor of Science in Software Engineering, along with industry credentials in generative AI, cloud, and cybersecurity. He founded FloorEye to bring real time floor safety within reach of the small and medium sized businesses that need it most.

About FloorEye

FloorEye turns existing camera infrastructure into an always on floor safety layer. It recognizes spills and wet floors as they appear, alerts staff within seconds, and keeps a time stamped record of hazards and responses, which supports both injury prevention and compliance documentation for small and medium sized businesses.

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