Academic Education Publishing House
-AEPH-

A Sociological Analysis of Digital Platform Algorithms' Control over Riders' Labor

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Abstract: Platform-based delivery work exemplifies algorithmic governance, where labor is managed through the reorganization of time, space, and recognition into machine-readable signals. This "algorithmic management" creates a control architecture that asserts market neutrality while producing asymmetrical dependence. Synthesizing empirical studies across jurisdictions and quantitative surveys, research shows platforms convert uncertainty into discipline. Algorithmic control operates as a triangular regime—platform metrics, consumer ratings, and urban infrastructure—generating a distinct form of labor power: command without supervisors, sanctions without due process, and incentives that individualize risk. While efficient in matching and coordination, its limitations stem from data extraction, risk externalization, and competitive isolation. Evidence consistently links algorithmic intensification to adverse psychosocial outcomes like burnout and risk-taking among riders, alongside tactical resistance and sporadic solidarity. This shift goes beyond flexibility vs. precarity—labor is reconstituted as continuously audited motion, turning the city into an instrument of management. Governance should therefore prioritize algorithmic due process, data access, and collective voice, treating platform control as infrastructural power rather than private preference.

Keywords: Algorithmic Management; Platform Labor; Gig Economy; Riders; Labor Process; Surveillance; Urban Sociology

1. Introduction

Urban delivery riders occupy a peculiar sociological position: highly visible in the streetscape yet institutionally invisible in many legal and organizational categories. Their work is neither the classical factory labor of a bounded workplace nor the professional autonomy imagined by entrepreneurial narratives. Instead, it is mediated by digital platforms that allocate tasks, price time, evaluate performance, and impose sanctions through software. Such platforms are frequently presented as neutral intermediaries that merely match restaurants, customers, and couriers. The routine experience of riders, however, reveals that matching is inseparable from governing. The app does not simply offer jobs; it structures what counts as a "good" worker, compresses delivery time into performance scores, and converts the rider's body and route into data streams that can be compared, ranked, and penalized.

Sociological analysis is particularly useful here because the phenomenon is not reducible to technology or economics alone. The algorithm is simultaneously a technical artifact, a labor discipline, a cultural script, and a political-economic instrument. When an app determines who receives high-paying orders, when "late" is defined by an opaque clock, and when deactivation occurs without a human conversation, control is enacted through a new grammar: probabilistic prediction, real-time surveillance, and behavioral nudging. The material consequences include income volatility, intensified pace, and the normalization of safety tradeoffs. Meanwhile, riders develop tactics—multi-apping, selective acceptance, deliberate signal manipulation, mutual-aid networks—that indicate not passive subordination but contested governance.

A common framing contrasts flexibility with precarity, implying that the question is whether rider autonomy outweighs insecurity. That framing obscures a deeper transformation: algorithmic platforms reorganize labor around continuous measurement and competition, turning autonomy into a managed variable. The apparent freedom to log in and out coexists with incentives that make logging out costly, and with ranking systems that punish those who reject

undesirable tasks. Consequently, "choice" often functions as a moral technology that shifts responsibility for system risks—traffic hazards, weather exposure, demand shocks—onto individuals. The relevant sociological puzzle becomes how such a regime stabilizes legitimacy while intensifying control.

The sections below develop a layered critical account. First, the conceptual foundations of algorithmic control are situated within labor process and organizational sociology. Second, an analytic framework is proposed—algorithmic control as a triangular regime linking platform metrics, consumer evaluation, and urban infrastructure. Third, evidence is synthesized from empirical studies, including survey-based and health-focused research reporting measurable associations between algorithmic management and burnout, work engagement, and risk-taking among riders. Fourth, rider agency is analyzed not as romantic resistance but as a patterned response that can be incorporated into platform design. Finally, the political-economic roots of the regime are identified and translated into governance implications.

2. Theoretical Foundations: From Managerial Hierarchies to Algorithmic Control

Algorithmic management is sometimes described as the "digitalization" of managerial functions. Such language is accurate but insufficient. Digitalization does not merely accelerate existing control; it changes the ontology of what is controlled. Labor process theory highlights how capital organizes work by separating conception from execution and by embedding control in the design of tasks, tools, and incentives. Platform logistics extend this insight: conception is encoded into models that predict demand and route efficiency, while execution becomes an optimization problem distributed across thousands of riders [1].

Organizational sociology adds that control is rarely only coercive; it is also normative and cognitive. In algorithmic settings, normativity is operationalized through rating thresholds, acceptance rates, and "on-time" targets, while cognition is shaped by dashboards and gamified feedback that teach workers how the system 'sees' them. This duality produces an odd moral economy. Instead of supervisors issuing explicit commands [2], platforms often present performance metrics as neutral facts. Yet metrics are never merely descriptive; they embody contested judgments about speed, customer satisfaction, and 'reasonable' waiting times at restaurants. The result is managerial power without direct managerial presence.

Algorithmic control is also infrastructural. Delivery work takes place in the city, and the city is not an inert background. Geofencing, heat maps, and dynamic pricing turn urban space into an instrument of governance. Riders are invited to chase "busy zones," remain online during 'peak' periods, and accept tasks that move them across spatial corridors defined by the app. Consequently, labor power is exercised by shaping the distribution of opportunity in space and time rather than by issuing a single directive [3]. This is why an adequate sociology must integrate labor process analysis with urban sociology and the sociology of quantification.

A crucial advantage of algorithmic management is coordination under high uncertainty [4]. Delivery demand fluctuates by minute and location; restaurants vary in preparation time; traffic conditions shift; and customer behavior is noisy. Platforms convert this uncertainty into calculable risk, enabling rapid matching and reducing idle time. The limitation is that the same calculus generates opacity: the scoring function that makes coordination possible is not easily explainable to riders, and explanation would reduce strategic advantage while inviting contestation. The root cause of this opacity is not simply technical complexity but the political economy of data: models are proprietary assets and their asymmetries are central to extracting value.

This root cause invites a supplementary lens: algorithmic control as a regime of 'contestable visibility.' Riders are made hyper-visible to the platform through GPS traces and behavioral logs, while the platform remains selectively invisible through unavailable parameters, undisclosed weights, and ambiguous policy enforcement. Visibility becomes the currency of power, and contestation shifts from wage bargaining to disputes over data, ratings, and account status. Such disputes appear individualized—a single rider contesting a deactivation—yet their structure is collective, because the system's thresholds are designed for population-level governance [5,6].

3. Research Design and Evidence Base
The analysis proceeds through theory-building synthesis. Rather than treating each study as an

isolated case, recurring mechanisms are extracted and assembled into a causal architecture. Evidence is drawn from peer-reviewed research on food-delivery platforms, including mixed-method studies combining interviews and surveys, ethnographic and auto-ethnographic work on rider practices, and recent quantitative studies linking algorithmic management to psychosocial outcomes such as burnout, work engagement, and risk-taking. This evidence base is suited to sociological inference because it covers multiple institutional contexts and measurement strategies, reducing the likelihood that observed patterns are artefacts of a single platform or legal regime [7].

Two methodological cautions shape interpretation. First, many platform studies rely on non-probability samples, and rider populations are heterogeneous in hours, dependence on platform income, and migration status. Consequently, claims emphasize mechanisms rather than population prevalence. Second, outcome measures such as burnout are mediated by broader life conditions—housing costs, social support, and local road infrastructure—making it inappropriate to treat the algorithm as a monocausal factor. The focus remains on how algorithmic features interact with broader contexts to amplify or dampen risks (Table 1).

Table 1. Selected Empirical Studies on Algorithmic Management and Delivery Riders

Study	Context	Platform(s)	Method	Sample (n)	Focus of algorithmic control
Griesbach et al. (2019)	US (multi-platform)	Instacart & others	Interviews + survey	55 interviews; 955 survey	Task allocation, evaluation, cross-platform variation
Heiland (2021)	Germany	Foodora/ Deliveroo	Interviews + auto-ethnography	21 Foodora; 14 Deliveroo	Geofencing and spatial corridors
Timko & van Melik (2021)	Netherlands/ Germany	Deliveroo	Auto-ethnography + interviews	9 months; 13 interviews	Practical enactment of platform labor
Liu et al. (2025)	China	Food delivery platforms	Survey + model testing	n=320	Algorithmic management → risk-taking
Dong et al. (2025)	China	Food delivery platforms	Survey + regression	n=953	Algorithmic management → burnout

4. Algorithmic Control as a Triangular Regime

Algorithmic control over riders is often reduced to the platform–worker dyad: the app assigns, the rider performs. Empirical work suggests a more complex architecture. Control is triangular, produced through interaction among three domains: platform metrics (internal optimization variables that define efficiency, reliability, and profitability), consumer evaluation (ratings, complaints, and expectations that outsource supervision to customers), and urban infrastructure (spatial constraints and hazards that become individualized responsibilities).

The triangle matters because it explains how platforms can claim limited responsibility while maintaining effective command. Platform metrics transform labor into comparable data.

Consumer evaluation provides legitimacy for sanctions ("the customer reported...") [8,9]. Urban infrastructure supplies the friction that converts these imperatives into bodily risk. The rider is positioned at the intersection: accountability flows inward (toward the rider), while explanation flows outward only selectively. This architecture also illuminates why control can intensify without formal employment. A conventional employer owns workplaces, supervisors, and schedules. Platforms instead own the informational interface. Control is exercised by governing access to orders, visibility to demand, and eligibility for bonuses. Such governance resembles 'market discipline' in appearance while functioning as managerial discipline in effect (Table 2).

Table 2. Dimensions of Algorithmic Control in Rider Labor

Control domain	Algorithmic mechanism	Worker-facing signal	Sociological effect
Task allocation	Matching/dispatch model; batching	Order offers; acceptance timer	Competition engineered through scarcity
Temporal discipline	Predicted ETAs; lateness thresholds	Countdown clocks; 'on-time' scores	Pace intensification; moralization of speed
Spatial governance	Geofencing; heat maps; zone pay	Busy-zone prompts; repositioning nudges	City becomes a managed corridor
Evaluation	Customer ratings; complaints; automated flags	Stars; warnings; 'quality' dashboards	Outsourced supervision; reputational precarity

Compensation	Dynamic pricing; surge; bonuses; penalties	Peak pay; quests; fee breakdown	Income volatility; self-exploitation
Termination	Automated deactivation triggers; fraud detection	Account locks; appeals portals	Sanction without due process

5. The Advantage–Limitation–Root Cause Sequence: Efficiency as Discipline

The promise of platform delivery is logistical efficiency. Coordinating thousands of small transactions requires real-time data and rapid decisions, and algorithms excel at turning fragmented demand into coherent routes. Riders benefit from reduced search costs: instead of roaming for customers, tasks arrive. Restaurants benefit from outsourced delivery capacity. Customers benefit from predictable estimated times.

Yet efficiency carries a structural limitation: it requires a benchmark of 'optimal' time and motion that is imposed on riders as a normative standard. A delivery that deviates from a model prediction is coded as inefficiency and becomes the basis for penalty, even when deviation is caused by restaurant delay, traffic, or weather. This reveals a moral inversion: external frictions are treated as individual performance deficits. The logic resembles classical Taylorism, but with a crucial difference: the standard is computed continuously and adapted to aggregate behavior, making it harder to contest.

The root cause of this limitation lies in the platform's need to manage uncertainty and protect service reputation while minimizing direct liability. Uncertainty is absorbed by rider flexibility, and liability is displaced through contractual classification and procedural opacity. In practice, the algorithm becomes a risk-transfer device: it distributes volatility across riders and uses rankings and incentives to ensure that volatility is borne voluntarily [10].

A supplementary theoretical lens clarifies why this displacement is stable. Platforms do not merely reduce transaction costs; they create a field of competitive isolation. Each rider experiences the system as a personal stream of offers and penalties, even though those offers and penalties are statistically patterned across the workforce. Isolation weakens collective interpretation: it becomes difficult to distinguish personal misfortune from system design. At the same time, it invites individualized optimization—gaming the app, learning 'hot' zones, manipulating acceptance—behaviors that appear as autonomy but often reproduce the competitive field.

6. Payment Architecture: Volatility, Piece-Rates, and the Production of Self-Exploitation

Compensation design is central to algorithmic control because it converts organizational goals into individual preferences. Delivery platforms commonly use piece-rates with dynamic adjustments (surge, quests, peak pay) that reward availability at specific times and locations. This architecture has an obvious advantage: it draws labor toward demand without fixed schedules. It also appears to preserve autonomy, since riders can refuse offers. The limitation is that dynamic pay makes wages uncertain and often encourages longer hours to reach targets. Bonuses are frequently structured as thresholds that require sustained online time, discouraging breaks and risk-avoidant choices [11]. Piece-rates also embed unpaid time—waiting for restaurants, navigating to zones—into the rider's responsibility. Qualitative research repeatedly documents how riders interpret the app's pay signals as both opportunity and coercion: a 'choice' to chase bonuses that is constrained by rent, debt, and household obligations.

The root cause is again political-economic. Platforms optimize for throughput and customer retention. If waiting time or cancellations threaten service quality, the system increases pressure on the supply side because supply is modular and replaceable. Riders' costs—bikes, fuel, phone plans, injuries—are externalized. The economic relationship resembles a market, but the informational environment resembles a firm: the platform knows more about demand, sets the rules, and can unilaterally redesign incentives.

A supplementary perspective from the sociology of valuation suggests that pay signals do more than allocate money; they assign worth to time. When the app labels certain hours as 'peak,' it implies that other hours are less valuable and that idle time is personal failure. Riders learn to interpret their own availability through the platform's valuation grid, gradually aligning life rhythms with system rhythms. This is discipline as temporal culture.

7. Sanctions, Deactivation, and the Problem of Due Process

Formal workplaces often rely on progressive discipline: warnings, documented evaluations, meetings, and appeal procedures. In platform delivery, sanctions frequently take the form of automated warnings, temporary suspensions, or deactivation triggered by ratings, suspected fraud, or policy violations. This mode of control has a managerial advantage: it is scalable and consistent. It allows rapid removal of accounts perceived as risky [12].

Its limitation is sociologically severe: it decouples punishment from intelligible justification. Riders may not know which event triggered a warning, why an acceptance rate threshold matters, or how an algorithm interpreted GPS anomalies. Appeals are often text-based and slow, intensifying the precarity of an already volatile income stream. The absence of face-to-face negotiation weakens procedural legitimacy and fosters a climate of anticipatory compliance.

The root cause is a structural tension between platform reputation and labor rights. Platforms compete on reliability and safety, and automated sanctioning reduces transaction costs. Yet due process is costly and can expose decision criteria. The proprietary nature of algorithms incentivizes opacity, and opacity creates discretionary power.

A supplementary theoretical contribution emerges by treating deactivation not merely as termination but as a form of social exclusion from an infrastructural market. When a platform dominates local delivery demand, deactivation resembles a denial of access to an essential livelihood infrastructure. This shifts the normative stakes: deactivation becomes less like a private business decision and more like exclusion from a regulated utility—suggesting that sociological debates over classification should be complemented by debates over infrastructural governance (Table 3).

Table 3. Burnout Prevalence among Riders and Key Predictors (China Survey Study)

Measure (Dong et al., 2025)	n	Key result (descriptive)	Predictor (model)	Coefficient/direction
Overall burnout level	953	Moderate burnout reported overall	Algorithmic management	Positive association with burnout
Burnout category: low	953	49.1%	Job satisfaction	Negative association with burnout
Burnout category: moderate	953	37.0%	Monthly income	Negative association with burnout
Burnout category: high	953	13.9%	Working hours	Positive association with burnout

8. Embodied Risk and Occupational Health: When the Street Becomes the Shopfloor

Delivery labor foregrounds an old sociological insight: control is ultimately imposed on bodies. The algorithm may be virtual, but it produces material consequences through speed targets, pay thresholds, and spatial prompts that riders experience as urgency. This is especially evident in safety outcomes. Occupational health research on platform work highlights psychosocial risks such as stress, time pressure, and exposure to harassment, while rider-focused studies add the physical dangers of road traffic and weather [13]

Recent survey-based evidence reports a substantial prevalence of burnout among riders and identifies algorithmic management as a positive predictor when controlling for other factors. The distribution of burnout categories—nearly half low, over one-third moderate, and a non-trivial share high—indicates that psychosocial strain is not confined to marginal cases. Associations with longer working hours and lower income further suggest a structural pattern: those who must work more for less are more likely to experience exhaustion. Where psychological resilience and job satisfaction reduce burnout, they function as buffers rather than solutions, placing responsibility on individual coping capacities.

Risk-taking provides another window into embodied governance. When estimated times are tight and bonuses require streaks, riders may adopt faster—and riskier—routes, reduce breaks, or ride in unsafe conditions. Model-based findings linking algorithmic management to risk-taking via stress and fatigue indicate that risk is not an accidental by-product but an emergent property of incentive design. In sociological terms, the platform commodifies the rider's risk-bearing capacity.

At the same time, algorithmic management is not unidirectionally harmful. Evidence of dual effects on work engagement suggests that

feedback and task clarity can support competence and motivation when experienced as informational rather than punitive. This ambivalence is analytically important: it demonstrates that algorithmic control is not simply surveillance; it is a contested organization of attention and effort. The challenge is that platforms often maximize the disciplinary advantages while providing minimal institutional support, leaving riders to cope with fatigue and uncertainty alone.

9. Rider Agency: Gaming, Interpretation, and Collective Experimentation

Rider agency is frequently described as 'resistance,' but a more precise account treats it as collective experimentation under opaque rules. Riders learn through trial-and-error how platform systems respond to behaviors. Multi-apping allows riders to hedge against demand shocks and reduce dependence on a single scoring system. Selective acceptance and strategic repositioning attempt to reshape the distribution of tasks. Information sharing in chat groups and informal networks transforms private experience into partial collective knowledge.

Auto-ethnographic and interview research documents practices that appear idiosyncratic but follow common logics: turning off GPS in certain areas, logging out briefly to 'reset' the algorithm, or interpreting patterns in offer sequences as evidence of how the system ranks them. Riders construct explanatory models of the algorithm. Such narratives are not superstition; they are attempts to interpret a black box. Interpretation itself becomes labor [14].

These practices show an advantage for platforms: rider ingenuity can stabilize service even when systems are imperfect. The limitation is that ingenuity can also undermine platform objectives, prompting redesigns that close loopholes. The root cause of this cat-and-mouse dynamic is that platform control depends on asymmetry. When riders learn too much, the platform loses predictive leverage.

Collective action, when it emerges, often arises from shared exposure to unpaid time, arbitrary sanctions, or sudden rule changes. The difficulty is that algorithmic governance fragments riders by shifts, zones, and individualized metrics. Solidarity must therefore overcome both spatial dispersion and informational isolation. Studies of courier mobilization highlight that collective power is facilitated when riders share physical spaces (e.g., common waiting areas), experience synchronized grievances (e.g., pay cuts), and build organizational intermediaries such as unions or advocacy networks. Algorithmic work thus does not eliminate class conflict; it changes its organizational conditions (Table 4).

Table 4. Documented Rider Coping and Solidarity Practices across Qualitative Studies

Practice	Observed in	Immediate function	System-level consequence
Multi-apping	Timko & van Melik (2021); Wang (2025)	Income hedging; reduce idle time	Erodes single-platform control; increases precarious juggling
Zone chasing	Heiland (2021); Veen et al. (2020)	Follow demand signals	Amplifies competition and congestion in 'hot' areas
Peer information networks	Wang (2025); Tassinari & Maccarrone (2020)	Interpret algorithm; coordinate	Partial collective knowledge countering opacity
Protest/collective bargaining	Tassinari & Maccarrone (2020)	Contest pay cuts and conditions	Challenges classification and governance

10. Political Economy of Algorithmic Control: Data Extraction and Risk Externalization

The preceding mechanisms—dynamic pay, deactivation, ratings—could be interpreted as accidental side effects of new technology. A political-economic reading treats them as structural features. Platforms compete in markets characterized by thin margins and high expectations of speed and reliability. Value is created not only by delivering food but by producing data: predictive models, consumer profiles, restaurant performance metrics, and real-time maps of urban demand. Riders are central to this extraction because they provide both labor and the data traces generated by labor. Risk externalization is the counterpart of data extraction. When riders are classified as independent, fixed costs shift outward: equipment, insurance, and downtime become individual burdens. Algorithmic management then functions as a coordination substitute for employment: platforms obtain many advantages of managerial control without the corresponding obligations. This structure also explains why legal debates over classification are persistently contested. Classification is not a technical detail;

it is the institutional mechanism that stabilizes a model of accumulation.

The algorithm thus embodies a specific social relation. It is not simply software but a governance device that connects dispersed riders to platform objectives through incentives and surveillance. The social relation is stabilized by three legitimacy narratives: neutrality (decisions are presented as data-driven and objective), choice (riders are framed as free agents selecting when and how to work), and innovation (platform design is treated as progress beyond 'old' employment).

Sociological critique reveals that these narratives do not merely justify; they constitute the labor regime. Neutrality hides political decisions about acceptable risk and unpaid time [15]. Choice moralizes structural coercion. Innovation reframes the withdrawal of protections as modernization. Yet the regime is not immutable: empirical evidence of dual effects on engagement indicates that alternative designs—transparent feedback, supportive supervision, fair appeals—can reconfigure outcomes (Table 5).

Table 5. Governance Principles for Constraining Algorithmic Control While Preserving Coordination Benefits

Problem	Sociological diagnosis	Governance principle	Operational implication
Opacity of allocation and pay	Information asymmetry as power	Algorithmic transparency (meaningful)	Disclose key determinants and allow independent audits
Arbitrary deactivation	Sanction without due process	Algorithmic due process	Notice, explanation, human review, and timely appeal
Risk-shifting to riders	Externalized bodily and temporal costs	Shared responsibility for safety	Minimum standards for delivery times; insurance and equipment support
Competitive isolation	Fragmentation undermines collective voice	Collective representation	Enable bargaining units or worker councils; data access for unions

11. Limitations and Future Research

Several limits to inference follow from the platform context itself. First, measurement is structurally constrained by proprietary data. Even when surveys capture riders' perceptions of algorithmic management, the parameters that generate dispatch priorities, pay adjustments, and deactivation thresholds remain largely inaccessible. This means that sociological claims must often infer organizational logic from its effects and from riders' interpretive labor. The inference is informative—especially when mechanisms recur across settings—yet it cannot replace direct audit access to decision systems.

Second, rider populations are internally stratified. Dependence on platform income varies (full-time, supplementary, occasional), as do transport modes and legal status. These differences matter because the same algorithmic feature can be experienced as opportunity by one group and as coercion by another. Future work would benefit from designs that model heterogeneity explicitly, distinguishing not only demographic groups but also exposure profiles such as hours worked during peak periods, reliance on incentives, and frequency of rating disputes.

Third, comparative work should treat cities as active mediators rather than passive backdrops. The same delivery-time target produces different risks depending on road design, policing practices, and climate. Integrating urban political economy into platform labor research enables a clearer account of why algorithmic control can be more punitive in some places: it is not merely a harder algorithm but a harsher infrastructural environment. Linking platform metrics to spatial data on accidents, congestion, and service geographies would sharpen causal explanation.

Finally, governance research should move beyond the binary of employee versus contractor to study institutional hybrids. Platforms already experiment with safety training, insurance schemes, and 'support' centers; states experiment with presumptions of employment, data transparency duties, and collective bargaining exemptions. The sociological question is which combinations reduce arbitrary sanctions and risk-shifting without destroying coordination capacity. That question invites interdisciplinary collaboration among sociologists, legal scholars, computer scientists, and public health researchers to design evidence-based constraints: auditability standards, contestability protocols, and participatory data infrastructures that allow riders to be represented in the systems that represent them.

12. Conclusion

Digital platforms govern delivery riders through algorithms that do far more than match supply

and demand. The governing logic reorganizes labor into a continuously audited motion through urban space, translating uncertainty into individualized discipline. Efficiency is real, yet it is achieved by embedding normative standards in predictive models, by outsourcing supervision to customers, and by shifting infrastructural risks onto riders. Empirical evidence indicates consistent links between algorithmic intensification and burnout, fatigue, and risk-taking, while also demonstrating dual motivational effects when algorithmic feedback supports competence and when institutional support buffers fatigue.

The most consequential sociological insight is that algorithmic control is infrastructural power: it governs access to livelihood through data-mediated interfaces that are increasingly essential for participation in urban economies. Treating such power as purely private obscures its quasi-public character. The governance implications therefore require more than minor transparency gestures. They require algorithmic due process, meaningful data access, and collective voice—mechanisms capable of converting individualized optimization into accountable coordination. Without such constraints, the platform city risks normalizing a labor regime in which risk is individualized, responsibility is diffused, and the algorithm becomes the quiet sovereign of everyday work.

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