Journal of
Automobile Engineering
and Applications

ISSN: 2455-3360
Volume 12, Issue 2, 2025
May–August
DOI Journal: 10.37591/JoAEA

https://journals.stmjournals.com/joaea

Review JoAEA

# AutoGen Bike: A Self-Sustaining Smart Electric Bike with Integrated AI Safety Systems

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***Abstract***

*This is the paper which gives the information about the self-sustaining electric bike. This also tells the idea about how energy is produced during its usage. The "Auto gen bike" is the most useful aspect that can change the future of the electric bikes. This also helps in the conservation of natural resources and nature. This also helps in the accidents happening to the two-wheel vehicle. This is achieved by the integration of AI integrated systems for better power usage and object detection. This idea is majorly focused on the usage of renewable resources. This also consists of lot of additional features which will be very useful in the field of autobike. The AutoGen Bike utilizes a combination of regenerative braking, solar panels, and kinetic energy harvesting to extend its battery life and reduce dependence on traditional charging methods. By transforming mechanical energy into electrical energy, the bike becomes more sustainable and cost-efficient. The embedded AI system not only optimizes power management but also provides advanced safety features such as collision detection, automatic emergency braking, blind-spot monitoring, and real-time traffic analysis. Furthermore, the system can learn from rider behavior to adjust motor output for improved efficiency and personalized performance. GPS integration and IoT connectivity also enable real-time diagnostics, remote monitoring, and route optimization. Voice-assisted control and smart dashboard functionalities offer seamless riding experience with minimal distractions. In urban areas where traffic congestion and environmental concerns are growing, the AutoGen Bike presents a solution that is both eco-friendly and intelligent. It represents a shift toward cleaner transportation while improving rider safety and comfort. The purpose of this paper is to highlight the design, working principle, and real-world applications of the AutoGen Bike, and its potential to revolutionize the e-bike industry.*

**Keywords:** Autogen, electric vehicle, Lithium-Ion, direct current generator, Arduino

## INTRODUCTION

In an era of smart cities, sustainable development, and growing environmental awareness, the landscape of personal mobility is undergoing a fundamental transformation. With rising fuel costs, increasing traffic congestion, and growing concerns regarding pollution and climate change, mobility is in urgent need of renewable, affordable, and self-sustaining options [1, 2]. While the adoption of electric vehicles (EVs) continues to grow, many rely on an external power connection to recharge the vehicle, which can be inconvenient when traveling to remote locations or for external trips. The current bicycle sharing programs and e-bikes in urban settings are having a positive impact by reducing fuel use, but there are still limitations, including limited battery range, theft, damage, and the continued dependence on charging stations and docking spots. To tackle this issue, we present the concept of the AutoBike [3, 4]. AutoBike is a distinctive smart

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Received Date: May 29, 2025
Accepted Date: June 30, 2025
Published Date: July 14, 2025

**Citation:** Penmetsa Swetha Naga Manikanta Raju, Ranjit Kumar Sah. AutoGen Bike: A Self-Sustaining Smart Electric Bike with Integrated AI Safety Systems. Journal of Automobile Engineering and Applications. 2025; 12(2): 41–49p.

 

electric bicycle that operates on electricity and also has the unique ability to create and store its own electricity without the use of an external charging source. The self-sustaining system utilizes a pedal-powered generator to convert human mechanical work into electrical energy via electromagnetic induction. The generated energy is stored in a lithium-ion battery that powers a hub-mounted BLDC motor [5].

AutoBike is not just a self-charging electric bike. It has Artificial Intelligence (AI) and Machine Learning (ML) to create a safe, controlled riding experience. The bike has a vision-based system of responses such that it can identify obstacles, assess road conditions, and apply brakes or take e-corrections. All this information is delivered with sensors and cameras mounted to the bike, like the driver's side mirror, at least one rear-facing camera, and cameras located around the handlebars so that the bike can identify objects when the steering system is directed by the rider. AutoBike can use deep learning algorithms like YOLO (You Only Look Once) or MobileNet. Examined each camera in real time, AutoBike can identify people, vehicles, or stationary or moving obstacles [6, 7]. This automated intelligent safety mechanism makes this type of smart, dynamic vehicle in both urban and rural riding conditions. Secondly, AutoBike supports a smart control interface from a mobile application and/or RFID system. The rider will be able to assess battery levels, speed, distance, and receive alert notifications when a possible obstacle encroaches around the front and rear of the bike in real-time. The rider can lock/unlock the bike, book rides, and change from pedal-assist to full electric. The autonomous-electric bike removes the need for physical rental kiosks and/or parking infrastructure in cities, to analyze cost savings, lost productivity, and less space to achieve the technology development [8].

AutoBike aims to develop a truly energy-independent, intelligent, and practical personal transportation system for everyday use. It is oriented toward use by students, computers, travelers, and delivery workers, who all need low-cost, dependable, mobile transport. Additionally, AutoBike promotes fitness, lowers carbon emissions, and helps provide a greener future [9]. With the concept of bringing together renewable energy generation, intelligent control systems, and AI-driven safety mechanisms on a single platform, AutoBike is primed to reimagine personal transportation. AutoBike is an integration of sustainable engineering principles, digital computing and analytics, and the importance of social responsibility. Thus, this project sets the groundwork for a future of mobility that is not only intelligent and safe, but also inherently sustainable, energy-independent, and accessible to everyone [10].

## RESEARCH REVIEW

Growing interest in sustainable city mobility has spurred innovation and adoption of electric bikes (e-bikes) and bicycle-sharing systems in the globe. Among the primary aims of such systems is to reduce dependence on fossil fuels, minimize carbon emissions, and provide an affordable way of commuting daily. Although the possible benefits of these modes of transportation are numerous, current e-bike technology also has some serious limitations, including long-distance traveling ability, energy sustainability, and intelligent riding assistance.

### Traditional Electric Bikes

Traditional electric bikes are mostly powered by a motor to assist pedaling, and the motor is powered by a battery. These electric bikes work and perform optimally for a short daily journey, but one has to keep the bike charged with electricity via a plug daily. Hence, traditional e-bikes are limited as they cannot fulfill the daily use needs of customers living in remote locations, commuting on an emergency basis, or who would like to travel long distances, and they do not have access to the necessary infrastructure for charging the electric bike. Most commercial e-bikes are not self-charging and lose effectiveness when battery power is exhausted. Their article, "Design and Simulation of Self-Charging Electric Bicycle," researched incorporating a dynamo-based energy harvesting system to overcome this weakness. The energy recovery was very low, though, and no AI-based rider safety systems were incorporated.

### Bike-Sharing Systems

Urban centers such as New York, Paris, and Beijing have embraced public bike-share systems as smart city features. The services enable users to lease bikes for temporary use. Although convenient, they are dependent on fixed stations, central maintenance staff, and periodic manual rebalancing of bike availability. Such systems are costly to maintain and are susceptible to theft and vandalism. Further, their reliance on kiosk stations incurs additional cost and restricts scalability in rural or remote locations.

**Solar-Powered and Regenerative E-Bikes**

Solar panels and regenerative braking have been tried as renewable sources by some innovators to power e-bikes. The Solar project incorporated a solar panel into an e-bike for supplementary charging. Solar-powered solutions, though, rely substantially on weather and need extensive surface areas to function effectively.

Moreover, although the regenerative braking systems assist in recovering some energy during deceleration, its contribution to the battery is largely minimal and hence does not suffice for long operation without external recharge.

**Application of AI/ML in Smart Mobility**

Recent developments in machine learning and AI have been used in autonomous vehicles and smart traffic systems. Chen et al. (2024) developed a real-time object detection system for electric scooters based on convolutional neural networks (CNNs), which effectively minimized collision hazards and improved safety.

Yet such technologies are seldom applied to personal micromobility vehicles such as bicycles, largely because of cost and technical complexity. Their safety potential for riders—such as automatic braking and collision avoidance—remains relatively untested in the e-bike market.

**Gaps Identified and Motivation for AutoBike**

Although self-charging and AI-driven technologies are available in parts, there is no existing solution that integrates all the following into one affordable, compact system:

- Human power-based self-sustaining energy generation.
- Real-time AI-driven obstacle detection and autonomous braking.
- Charging station independence.
- Urban and rural friendliness.
- Cost-effectiveness close to traditional e-bikes.

AutoBike solves these problems by combining pedal-driven energy generation with smart control systems. It uses machine learning algorithms to provide rider safety while being a self-sufficient electric mobility device that reduces the need for external infrastructure.

## PROBLEM STATEMENT

In the last few years, e-bikes have been a common alternative to conventional gas-powered two-wheelers for local travel and urban commuting. As e-bike usage increases, most current e-bike solutions still suffer from some inherent deficiencies that lower utilization, especially in rural or off-grid locations, off-grid applications, or for long-distance transport.

One such problem is that e-bikes are dependent on site's external charging points. When batteries run out of charge while plying in rural regions or going on a long journey, e-bike operators struggle to get charging stations or access to an electricity supply. This aspect renders their usage less than ideal for extended travel or emergency purposes.

Also, current e-bikes lack individual built-in energy conversion systems, though some models present the idea of solar recharging or regenerative braking, these options gather limited or irregular energy depending on the conditions of the environment.

 

The further advancement of contemporary e-bike technologies today is also hindered by the lack of prominent safety systems, which use integrated artificial intelligence (AI) and machine learning (ML) systems. Unlike most modern passenger vehicles, which utilize varying degrees of real-time vehicle obstacle detection, speed identification and tracking, or automatic braking systems, the majority of bicycles are not equipped with any of these features. Consequently, e-bikes are less safe and inherently more at risk of accidents, especially when used in high-traffic areas or in a poorly visible environment. Furthermore, rising fuel prices and environmental ecologies are creating a need for cleaner, sustainable, and affordable transportation methods; however, electric and hybrid bicycles remain too costly, and their high-maintenance requirements are a serious barrier for day-to-day travel for middle- and lower-income consumers. For these reasons, there is an acute need for a new electric bicycle solution that will preferably: Does not depend on charging stations outside capabilities. Produces its own electricity, made from user pedaling and other internal mechanisms. Provides real-time safety solutions that will utilize artificial intelligence (AI) and machine learning (ML) systems. Remain at or are economically feasible for daily commute.

The AutoBike concept tackles these issues directly by providing a self-sustaining, electric bike that incorporates energy-harvesting technologies, smart safety features, and a low-cost, efficient design for urban and rural environments.

## OBJECTIVES

The primary objective of the AutoBike project is to create a smart electric bicycle that is suitable for everyone and can help users travel conveniently, without the hassle of fuel and worry about charging stations. Our project should be a valuable modality of transportation for all and support a variety of users—from daily commuters in the cities to people living in villages or remote areas. Our specific project objectives include: Create an electric bike that does not need petrol or regular charging. Instead, the bike will generate electricity by using a pedaling mechanism, whereby just a few minutes of pedaling at a moderate pace will charge the bike's battery and be powered. Design the bike to have smart features using Artificial Intelligence (AI) and Machine Learning (ML). Ultrasonic Radar (UR) features will activate in order to detect items in front of the bike and automatically apply the brakes where necessary, to keep the rider safe. Ensure that the mechanism that generates and stores electricity is efficient, consistent and lightweight. Users should not be working too hard when they are pedaling with energy they have created, nor should they worry about the bike's battery running out. Devised a cost-effective design, so that even customers with limited finances, will be able to access this smart technology for their active lifestyle or to get around.

## METHODOLOGY / DESIGN AND WORKING PROCESS

The AutoBike was designed to be so much more than just an electric bike. It's an intelligent, independent vehicle that uses human power, intelligent technology, and clean energy—all in one vehicle. Below is a step-by-step description of how the bike operates and how each system is constructed and connected.

### Pedal-to-Electricity System

The most significant aspect of the AutoBike is that it generates electricity while you pedal. When you paddle, a tiny generator (such as a dynamo) attached to the front or rear wheel converts your paddling energy into electrical energy. This convert based on a simple principle of electrodynamics: rotating magnets in loops of wire create electric current. This electric current is used to recharge the battery which energizes the bikes motor subsequently. You do not need to pedal continuously—just enough to keep the battery charged as you roll.

### Battery Storage and Motor Connection

The energy created by the bike rider's pedaling motion is saved into a rechargeable lithium-ion battery, secured on the bike frame. This battery is linked to a brushless DC (BLDC) motor that is attached to the rear wheel. When the battery has sufficient power, the motor assists in the propulsion of the bike. The motor makes riding comfortable, especially when going uphill or long distance. The motor controller shall decide how much wattage power to command to the motor based on pedal power input and assists contribution needed.

**AI Module for Object Detection and Auto-Braking**

In enhancing the AutoBike for safer and smarter riding, we have included a small AI module that will serve as the bike's "vision and brain". The system uses a camera or sensors (ultrasonic sensors or LiDAR) and constantly monitors the directions ahead of the bike. A very simple machine learning model will help the bike to recognize objects, such as cars, people, road blockages, etc. If something appears in the path too close, such as a person crossing the street, the system will activate the brake automatically and decelerate the bike avoiding accidents. This will make the AutoBike great for activity in crowded areas or narrow village roads where safety is a priority.

**Complete System Integration**

All the systems: generator, battery, motor, sensors, AI module, and brake, are interfaced to a microcontroller (such as Arduino or Raspberry Pi). The controller acts as the bike's "central nervous system." It gathers data from the pedals, motor, and sensors, and makes real-time decisions: How much power to transmit to the motor– When to charge the battery– When to activate the brakes– When to signal the rider (buzzer, LED, etc.). The rider can view important feedback (e.g., battery level, alerts) through a small display screen or smart device app attached to the bike (Optional). You can create a simple block diagram (drawn manually or digitally) to help explain: Pedal → Generator → Battery → Motor → Rear Wheel AI Camera/Sensor → Controller → Auto Braking Display Module → Battery, Speed, Alerts.

This smart layout keeps everything lightweight and cost-effective while still being powerful and intelligent.

**COMPONENTS AND TECHNOLOGIES USED**

In bringing the AutoBike into existence, we leveraged a variety of hardware and software tools that were smart, efficient, and easy to implement. Each component actively participates in the operation of the bike, generating its own electricity and protecting the rider. Below is a summary of the primary components and technologies used.

1. *Direct current (DC) generator (or dynamo):* This is the central core of our pedal-to-electricity system. When the rider pedals, it rotates in the generator that converts mechanical energy to electricity. The electricity gets stored in the battery. It is a straightforward but effective means to capture and convert human energy to usable energy.
2. *Li-ion (lithium-ion) battery:* When pedaling, the electricity produced gets stored in a rechargeable lithium-ion battery. These batteries are light, durable, and widely applied in electric vehicles and EVs. The battery delivers a consistent power supply to the motor and other electronic components on the bike.
3. *Brushless direct current (BLDC) motor:* We selected a BLDC motor to drive the rear wheel. The motor is energy-efficient and delivers smooth and quiet support when pedaling, which proves especially useful on long roads and steep hills. The BLDC motor takes power from the battery and it automatically understands how much help the rider requires.
4. *Raspberry Pi or Arduino (microcontroller):* This component functions as the bike's brain. It oversees everything—checking battery status, balancing motor function, collecting sensor inputs, and executing AI integrated code. Raspberry Pi can be used for more detailed tasks (like AI based image extraction) but for basic control systems, students can use an Arduino.
5. *Ultrasonic sensors and camera:* These components allow the bike to "see" its environment. Ultrasonic sensors are able to report the distance between the bike and objects. The camera is capable of capturing real-time video and relaying object detection. Both of these components are integrated into the AI to help the bike recognize its environment.

 

6. *AI and ML models (e.g., YOLO - You Only Look Once):* To combat the challenge of creating a smart bike, we trained a simple machine learning model (like YOLO) that detects objects in an environment, which can include a person, vehicle, or obstacle. The model can process frames from the video feed of the camera and predict the appropriate time to alert the rider, apply brakes, or take split second action.
7. *Auto braking system:* The auto braking system connects the sensors and camera system to detect if an object is too close or if the bike is going too fast for the crowded area. In this case, the controller sends a signal to slow down or stop to potentially avert an accident.
8. *LCD display or mobile app:* Added a small LCD display or mobile app to provide real-time data to the rider, such as battery level, speed, type of obstacle, or energy consumption data. In a sense, it works like a dashboard for the bike. Altogether, these system components make the AutoBike smart, self-sufficient, and safe. The best part—the universal access, affordability, and easy software upgrades will help adapt to advancements in technology.

## IMAGINARY BLUEPRINTS

Figures 1 and 2 illustrate the structure of an autobike and the various internal system configurations of an autobike, respectively.

## ADVANTAGES

1. *Self-sustainable and eco-friendly:* The most notable benefit is that the AutoBike requires neither petrol nor charging. Rather, this bicycle generates its own electricity by human pedaling, a fantastic feature that offers an environmentally-conscious and fossil fuel-free experience.
2. *Economic in the long run* although the bicycle's initial setup may be a bit expensive compared to a conventional bicycle, you will save a significant amount of money in the long-run, such as the cost of charging stations or gasoline. This is especially useful for daily students, commuters, and users in rural areas.

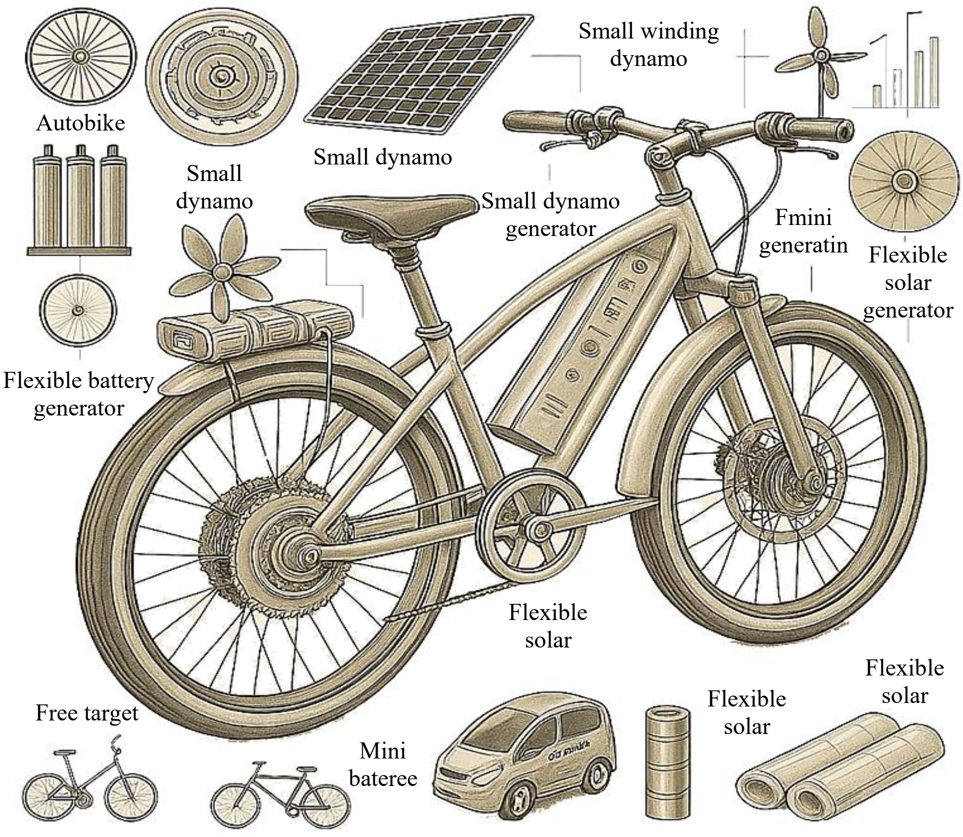


**Figure 1.** Structural design of AutoGen bike.

 

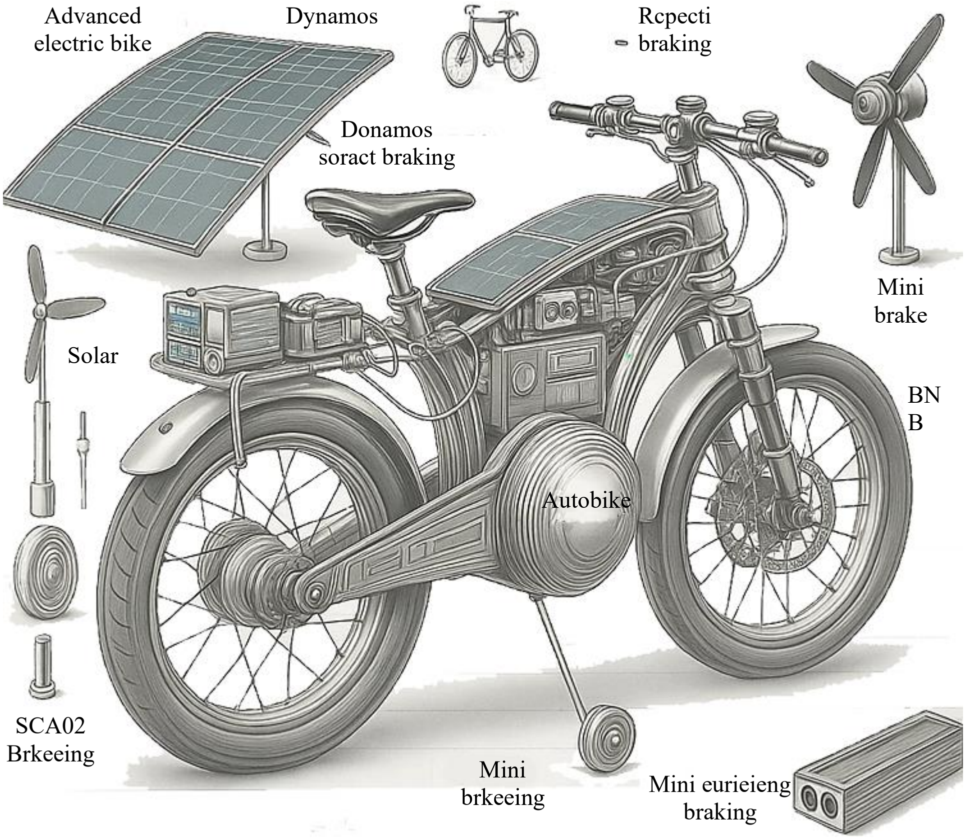


**Figure 2.** Internal system configuration

3. No need for charging points as it charges itself as the bicycle generates its own electricity, you will not have to **search** for a plug point and will not be concerned about running out of charge on long cycles—an exciting feature if you reside in a place where electricity or charging points are difficult to find.
4. *Smart safety features* with AI-based hardware and auto-braking functions, the bike is vigilant of the road. These features can **assist** in reducing accidents via auto-slower software conditions once it senses a person or vehicle too **close**.
5. *Dental health* as the bicycle requires some pedaling to generate electricity, the user receives light exercise while commuting. This continues your relative health, especially for people with sedentary jobs and lifestyles.
6. *Sustainable living* AutoBike encourages a clean, green mode of transportation based on the user's engagement. This is a small step to combating pollution and adding renewable energy to your routines.

**Limitations**

1. Electricity production is determined by your pedaling. The bicycle system only produces electricity when you are pedaling. If you cannot pedal for long periods, which happens when riding steep hills or if you are tired/stressed, then the power provided from pedaling stops. You may need an additional charging option as a backup in a pinch.
2. *Higher cost upfront:* By adding some combination of a generator, battery, sensors, and an AI module, this bicycle is automatically more expensive than a normal bicycle. While it is less expensive than an electric bicycle, the total buying cost may remain an issue for the low-income buying segment.
3. *Weather dependent:* In rainy weather, or if the temperature drops extremely low, the sensors and electronics will not operate optimally, unless they are properly waterproofed and insulated. Additional protection may add weight and cost.

 

4. *Limited AI capabilities:* By utilizing flexible and simple AI models, the system is economically proficient; however, their performance may not be as consistent as the commercial high-end systems. Therefore, the bicycle may not recognize every single obstacle accurately, especially in highly populated and complexity ridden situations.
5. *Maintenance and skillset:* While the bicycle is primarily an automated machine, it may still require maintenance of parts such as the generator, sensors, or controller. Individuals living off-site may require instructions and/or training to resolve simple issues. In conclusion, the AutoBike is a significant idea with substantial benefits such as cost savings, environmental protection, and improved road safety. Through some advancements and thoughtful utilizations, limitations can be mitigated, or corrected for future models.

**Future Scope**

The AutoBike has already established itself as a self-sustaining, smart use of energy. In the future, we hope to further push those boundaries with more innovative, renewable features. These will be the upgrades we would introduce:

1. *Dual dynamo system (front and rear tires):* To increase power generation on the AutoBike, we would want to attach dynamos to the front and rear wheels. This would provide a greater energy efficient output while pedaling, resulting in a quicker battery charge, especially on long rides.
2. *Mini dynamo on chain mechanism:* We could attach a small, high-efficiency dynamo close to the chain. When the chain rotates, it will generate additional electricity – without adding any effort to pedaling comfort. This provides yet another method to collect energy from the user's effort.
3. *Solar panel integration:* We could include flexible solar panels that could be secured on/around the bike frame /or modify mudguards to mount the solar panel/s, which would allow the panels to collect sunlight during your riding and parked periods. The solar panels would serve, like the dynamos, to provide additional battery charging, especially when riding in sunny regions, or to benefit those cyclists with rides in the daytime.
4. *Mini wind turbines for cooling and charging:* We want to attach small wind turbines (micro windmills) on the frame or on the front of the bike, which will spin from the wind created while you ride and generate electricity. It can also direct airflow to help cool the motor and other electronics during longer rides or climbs.
5. *GPS navigation and tracking:* We will add a GPS system for route guidance, logging trips, and theft deterrence. The GPS will also track battery usage on specific routes, leading to better route planning based on terrain and available power.
6. *AI-driven terrain adaptation:* The AutoBike will utilize AI and machine learning to analyze terrain and riding behavior, adjusting motor support levels depending on the condition of the road. Developing AI and machine learning capabilities saves on battery efficiency, while also improving rider comfort and control.
7. *Charging compatibility:* Future versions may include compatibility with wireless charging pads, which would enable the rider to charge the bike at public stations or in their garage without needing to plug in any charging cables.
8. *App functionality:* There will be a dedicated mobile app that allows the user to monitor battery level, charging stats, GPS routes, pedaling effort, and more. The app may also push maintenance alerts and even implement real-time road or weather alerts.
9. *Voice notifications and safety alerts:* The bike will come with voice notifications to alert the rider of battery preservation, obstacles ahead, or if they exceed the speed limit while riding. There may also be an emergency notification feature to alert contacts if something happens and the rider does not respond.
10. *Regenerative braking:* This system will enable the bike to recover energy when braking or riding downhill. In short, the bike would recycle that movement into usable energy and recharge the battery. With wind-based power-generation, chain-driven mini-dynamos, and solar panels, the AutoBike almost becomes fully renewable—generating power while the rider is in motion, as well as using the power of the sun and wind. The longer-term vision is a self-sustainable smart bike for urban and rural travel.

 

## CONCLUSION

The AutoBike project is not merely another electric bike; rather, it encompasses a reimagination of how we travel between places, in a more efficient, greener, and more sustainable fashion. By pairing basic human effort with intelligent systems for energy generation, such as pedaled dynamos, solar panels, wind turbines and a mini motor-generator mounted near the bike chain, the AutoBike generates its own power, eschewing external power or fuel needs. In addition to the clean power systems, we've also introduced features such as AI based safety systems, automatic braking, GPS tracking and the potential for a mobile app interface transforming a regular bike into a smart, self-sustaining travel companion. This concept will help residents of rural areas who do not have easy access to fuel or electricity while providing students, delivery workers, or any riders looking for an affordable mode of transportation, with a cleaner option.

With a few future enhancements—the ability to have voice alerts, adaptive learning, and wireless charging—the AutoBike could be a genuine breakthrough in personal transportation. It is cost-saving, environmentally sustainable, and safe—all while helping you stay active and healthy. This is just the beginning; the AutoBike could actually lead us into a whole new era of smart and independent travel with continued innovation.

## REFERENCES

1. Kalair A, Khan N, Abas N, Haider A. Review of electric bicycle technology and its integration with renewable energy sources. Renew Sustain Energy Rev. 2021; 135, 110120. https://doi.org/10.1016/j.rser.2020.110120.
2. Zhang Y, Thomas VM, Brown MA. Evaluation of urban bicycle sharing systems from a sustainability perspective. Transp Res D: Transp Environ. 2011; 16(8), 592-598. https://doi.org/10.1016/j.trd.2011.05.006.
3. Hussain I, AdithyaKumar, Venkatesh S, Kumar S, Pragatheeshwarar. Fabrication of self-charging electric bike. Int J Pure Appl Math. 2018;118(22A):809–814.
4. Wang C, Zhang J, Yang H, Jin H. Object detection algorithms for smart vehicles: A review. IEEE Access. 2020; 8: 181885–181906. https://doi.org/10.1109/ACCESS.2020.3029074.
5. Bhuvana J, Gautam CK, Yadav DK, Sharma N. Utilizing artificial intelligence and IoT for enhanced renewable energy management in smart cities. E3S Web Conf. 2024 Jun;540:13009. doi:10.1051/e3sconf/202454013009.
6. Vats H, Singhal A. Renewable energy systems for self-powered bicycles: Design concepts and future prospects. Int J Mech Prod Eng Res Dev. 2022; 12(3): 123–130.
7. Kanakasabhapathi Pradheep, Namarata Prakash, Gowrishankar R, Keerthivel P. Self Sufficient Charging Control System for Electric Bicycle Application, March 2024, Conference: 2024 5th International Conference on Intelligent Communication Technologies and Virtual Mobile Networks (ICICV).
8. Anusha G, Mohamed Musthaqeem A, Loshitha R K, Logeshwari K. Wheel-To-Watt: Dynamic wheel energy harvesting for On-The-Go EV charging, December 2024, Conference: 2024 3rd International Conference on Automation, Computing and Renewable Systems (ICACRS).
9. Pedro Félix, Luís A.C. Roque, Ismael Miranda, António Gomes, Battery energy storage system optimal sizing in a battery electric vehicle fast charging infrastructure, U Porto J Eng. November 2023;9(5):40–50.
10. Sonyabapu ZK, Nivrutti VS, Sunil P, Vilas RS, Bhanegaonkar TR. Energy regeneration and simultaneous battery charging of EV and BMS. Int J Adv Res Sci Commun Technol. 2025 May;5(2):735–40.

 