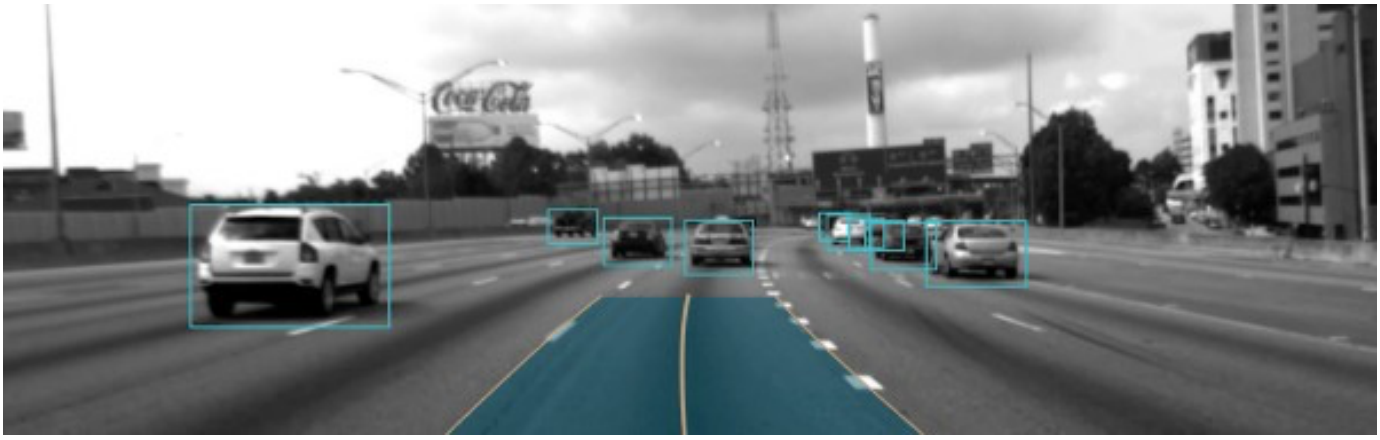

AUTONOMOUS FUSION

August 2018

Dear Autonomous Fusion Enthusiasts:

Mark your calendar!

Stephen Welch from Autonomous Fusion will lead the Charlotte Bots and AI meetup on October 3rd in Charlotte, NC. The topic for this meetup:

> **How to Drive a Car with a Camera - A Brief History of Computer Vision for Autonomous Driving**
> "In this talk, we'll use the Jupyter notebook to take a data-based approach to this question. Using real driving data and real algorithms in the notebook, we'll get as close as we can to the unique historical and modern approaches to this deep and compelling problem."

The Charlotte Bots and AI is a group for all technology enthusiasts that are learning, venturing or building bots and AI based applications. For more information and registration, visit the meetup website.

Stephen Welch is VP of Machine Learning at Autonomous Fusion and author of the YouTube channel Welch Labs. At Autonomous Fusion Stephen leads the design, development, and testing of machine learning algorithms for autonomous driving. As the author of Welch Labs, Stephen creates engaging math, science, and machine learning content for YouTube, and has earned 150k+ subscribers and 8M+ views.

Autonomous Vehicles and Job Creation

Excerpted from an article by Carmen Reinicke for CNBC

New technology is often met with fear, and self-driving cars are no different. Americans are hesitant to trust autonomous vehicles, according to the Pew Research Center. Two fatal accidents this year did not improve consumer opinion. There is also worry about the number of jobs the new technology might eliminate.

Yet the autonomous vehicle industry is creating jobs, as well, especially as multiple companies race to put the first self-driving car into action. Autonomous driving job listings increased 27 percent year over year in January 2018, according to ZipRecruiter, an online employment

marketplace. From the second quarter of 2017 to the second quarter of 2018, the amount of postings boomed 250 percent on the site due to a hiring spree at the beginning of the year. There is anecdotal evidence that start-ups are growing. Traditional automotive companies are also investing. Ford recently announced that the automaker plans to spend $4 billion on autonomous vehicles by 2023. General Motors will pour $100 million into self-driving cars, and Toyota launched a $2.8 billion self-driving car company in Tokyo.

Who will be impacted first?
In 2015, some 15.5 million workers in the U.S. worked in jobs related to driving, according to an August 2017 report from the Department of Commerce's Economics and Statistics Administration. Only 3.8 million of those workers operate motor vehicles such as a truck or taxi. Among those workers, truck drivers are more vulnerable to automation because they drive mainly on highways, and that type of navigation is easier to automate than negotiating city streets. The remaining 11.7 million, who drive as part of job positions such as mail carriers, firefighters and emergency medical technicians, are likely to benefit from new technology. It is estimated that autonomous cars could eliminate 300,000 driving jobs a year, according to a May 2017 report from Goldman Sachs. But that won't happen right away; the report estimated that from 2025 to 2030, autonomous cars will be 20 percent of car sales. How fast new technology disrupts driving jobs is important, said Amitai Bin-Nun, vice president of autonomous vehicles and mobility innovation at Securing America's Future Energy, a nonpartisan nonprofit that advocates for reducing U.S. oil dependence. Jobs will not disappear overnight, Bin-Nun said. There are many steps between zero and full automation. The workforce has shown resilience during gradual transitions in the past, said Bin-Nun.

In the short term, Bin-Nun said there will be many things that make driving safer and less stressful. "Autonomous cars are going to largely eliminate jobs seekers weren't interested in and create opportunities in work that people will find more rewarding," said Ian Siegel, co-founder and CEO of ZipRecruiter. Indeed, there is already a shortage of truck drivers in the U.S. With the unemployment rate falling to 3.9 percent in July, companies have had difficulty recruiting for the strenuous job.

In the future, autonomous cars may contribute very little to unemployment. The projected increase in the unemployment rate by autonomous vehicles is between 0.06 and 0.13 percent during the decade from 2045 to 2055, according to an assessment by economist Erica Groshen published in a June 2018 report by Securing America's Future Energy. The report also notes that new technology has historically had positive impacts on the economy, increasing productivity and lowering costs. Two examples are the internet and the interstate highway system. The internet boosted company profitability 10 percent in the early 2000s, according to a 2011 study by the McKinsey Global Institute. In turn, the interstate highway system had a return on investment of more than 30 percent between 1950 and 1990, according to a recent report from Compass Transportation.

Jobs available now
Companies are currently hiring engineers, technicians, software developers and designers to build autonomous vehicles. But careers outside of engineering are expanding in the industry. One of the most sought-after jobs, according to ZipRecruiter, is strategic account manager. The role is mostly focused on sales, according to the site. There are also increased opportunities in safety and testing as autonomous vehicle companies race to get cars ready for the road.

These are the top 10 autonomous driving jobs on ZipRecruiter

Rank	Job
1	Perception Software Engineer
2	Strategic Account Manager
3	Field Service Technician
4	Industrial Engineer
5	Customer Success Field Representative
6	Field Autonomy Engineer
7	Functional Safety Engineer
8	Autonomous Navigation Software Engineer
9	Robotics Engineer
10	Electrical Engineer

Source: ZipRecruiter

"There's a huge opportunity to test your software in simulated environments," said Bert Kaufman, head of corporate and regulatory affairs at Zoox. Software developers have come from the gaming industry to help build out these testing platforms for Zoox, he said. Car maintenance and logistics positions will also continue to grow, said Kaufman.

"Whether it's maintenance technicians, fleet oversight, remote oversight of the fleet, there's still going to be a need for service technicians to maintain and serve the fleet," said Kaufman.
As self-driving cars become more prevalent, the kinds of jobs available will expand, said Siegel of ZipRecruiter. "In the emergence of any new technology, the preponderance of jobs are more skilled, more technical positions," he said. "People put layers of simplification on top of it, which opens up access for less-trained people to participate into that industry." The world won't need fewer mechanics, he said. In addition, a focus on skills could open opportunities for those without a college degree.

Societal benefits
Much like the creation of the interstate highway system or the internet, new autonomous vehicle technology has the potential to have a widespread impact on society. "The benefits outweigh the cost by a large margin," said Bin-Nun.

Safety is one. Nearly 38,000 people died in car crashes in 2016, according to the National Highway Traffic Safety Administration, and most serious crashes are due to human error. "Autonomous vehicles will never be drunk, distracted or drowsy," said Kaufman. Beyond safety, self-driving cars could contribute to major gains in fuel efficiency, lower transportation costs to the consumer and increase access to rural areas. So far, 33 states have introduced legislation about autonomous vehicles, according to the autonomous vehicles legislative database from the National Conference of State Legislatures. Leaders are also pushing for legislation on the federal level. The SELF DRIVE Act was passed with bipartisan support in the House in September 2017. Now,

it goes to the Senate. "Here's what we know – they're coming faster than anyone realizes, and they will be a sea change in society," said Siegel.

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As always, we thank you for your support. Please email your questions and suggestions to info@autonomousfusion.com

Best Regards,
The Autonomous Fusion Team
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