AIRWORKS

AMT advanced media technologies

Unlocking Max Speed and Scalability

How AI is Revolutionizing the Walkout Process for 10x+ Faster Basemap Creation

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Introduction

The Telecom Industry is facing an onslaught of challenges. A surge in project demand is compounding the difficulty of tight timelines, as leaders are struggling to enhance the productivity of their existing workforce within the time constraints.

And with the new surges in funding from various government programs, **speed to deployment has never been more important.**

For leaders like you, the key to securing funding lies in demonstrating your ability to complete broadband installations efficiently and on (or ahead of!) schedule.

Telecom firms have gone from delivering 3 miles per day to delivering 17+ miles per day with AirWorks' new digital walkout process – and you can, too.

Over the course of this eBook, you'll get an in-depth understanding of how exactly this process works, the setup steps involved, and the overall impact on your ROI.

Get ready to streamline:

- + High-level Design
- + Low-level Design
- + Digital Make Ready
- + ROW Permitting
- + Construction Documents - BOM
- + As-Builts

With this information at your disposal, you'll have a better grasp on how you can work more efficiently to save time and money.

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Current Challenges Telecom Firms Face

Challenges Faced by Telecom Firms

In order to remain competitive, leaders at telecom firms must ensure their team operates at max efficiency and peak speed – **yet many are just struggling to keep up with demand**.

There's been an onslaught of projects coming from both government subsidies and private equity, each with its own incredibly tight timeline.

The problem?

The entire workflow relies largely on manual processes. Various project stages are limited to what a single individual can do in an 8 hour span, making it difficult to predict timelines (and even harder to find ways to speed them up).

Adding fuel to the fire? A tight labor market and frequent staffing shortages means that traditional project timelines aren't just slow, but challenging to manage.

Now, leading telecom firms are relying on a new digital walkout process – AirWorks Automate – which empowers smaller teams to act like bigger ones and hit their deadlines faster than ever before.

AirWorks is Trusted By Industry Leaders:

Jacobs MasTec LightSett TILSON

How Does AirWorks Solve These Problems?

With Artificial Intelligence (AI), it's easier to be faster.

AirWorks' AI algorithms are built on more than 50 thousand hours of data perpetration by processing and training thousands of acres of geospatial data at various GSD levels.

With AirWorks Automate, you can **automate away the time-consuming processes in key project phases**, empowering your team to deliver more projects, faster.

The Results?

Speed

- AI data processing is fast
- Cut project delivery timelines by 50%
- Confidently meet deadlines & secure funding
- Reduce time to project start date

Scalability

- AI scales instantly
- Enables you to work on many projects simultaneously
- Increase capacity without hiring
- Triple your workload without overloading your staff

Accuracy & Quality

- AI + human eye
- Consistent
- Reliable
- High-Quality
- Eliminate need for significant QC post AirWorks
- Trusted Deliverables

Business Impact

- Extremely competitive rates
- Give resources back to firm
- Price reduction with scale
- Drive revenue

Read on and we'll show you exactly how it works and how it's being used in Telecom projects today.

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AirWorks Automate: How it Works

AI Uses Cases in Telecom

The current applications of AI in Telecom projects cover a wide range of project types and use cases.

Hand over the tedious-but-necessary work to our autonomous feature extraction software to boost efficiency throughout your project, **whether you're jumping into detailed design work or just getting started with permitting**.

See what you can get done – faster – with AirWorks Automate:

+ Broadband engineering
+ ROW Permitting
+ Fiber to the home (FTTH) expansion
+ 3D Pole Mapping

The Impact of AI on Telecom Timelines

Without the use of AI, each step in the process of creating a basemap is slow and labor intensive.

AirWorks' Automate uses machine learning to reduce the amount of time needed to complete each step, **acting as a force multiplier for your existing labor force.**

This new Digital Walkout Process has created significant impact for our clients:

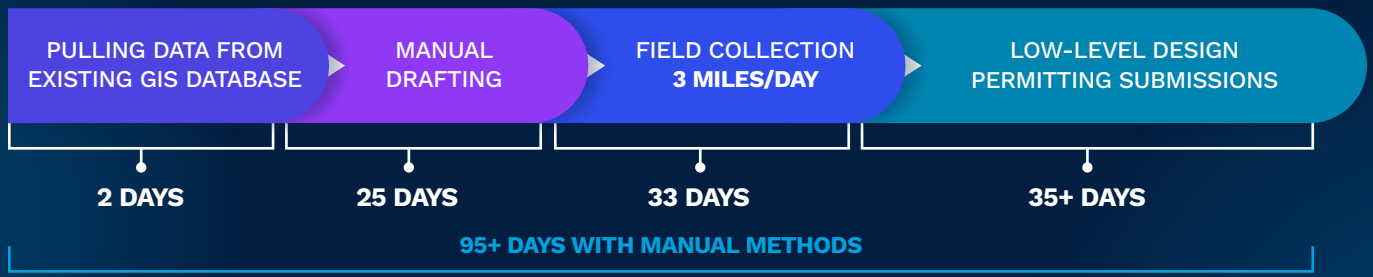
+ 10x+ Faster Basemap Creation
+ 20-30x more Engineering Miles per Month
+ Elimination of a ~5 month project backlog

Beyond unparalleled speed, Telecom leaders are enjoying fewer unnecessary field visits, a safer work environment for field crews, and up-to-date digital assets that can be leveraged at other project stages. So how exactly does it work?

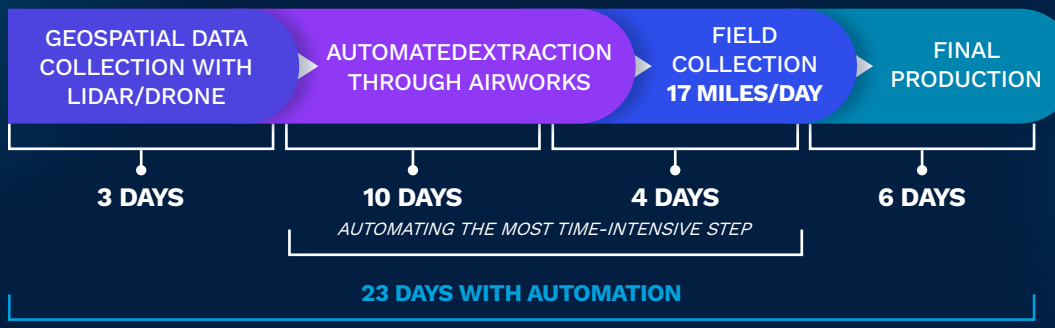
Current Problem: Generating **Telecom Basemaps**

CURRENT PROCESS - ALL MANUAL

*Assuming 100 miles, 120 ft row



AUTOMATED WORKFLOW - WITH AIRWORKS



+75%
Time savings with AirWorks

Data Input Types

Different projects require different data input types, which require tailored algorithms and processing techniques.

AirWorks Automate processes a wide range of imagery and point cloud data – whether collected via drone, manned aircraft, satellite, or mobile methods.

This increasingly diverse data builds an increasingly stronger machine learning model with increasingly more accurate output.

So if you're uploading your own data, you can rest assured knowing that we're "data agnostic" and can manage a whole host of remote sensing sources.

Is in-house data collection not possible or efficient? Work with any of our partners to source your data, or hire them for a bespoke data collection project.

Input Data Sources

Data Sources for Different Use Cases

Telecom projects may require different data sources, depending on specific parameters and goals.

For Example:

Manned Aircraft (2D)

This data source is best suited for quick projects that don't require high accuracy. This data source can be very cost-effective if using commercially available data (for example, with Nearmap Vertical).

Used for:

+ Permitting
+ High-level design

Drone Imagery (2D) + Aerial LiDAR (3D)

This data source is best suited for detailed, precise work. Although more expensive compared to a variety of other data sources, Drone Imagery + Aerial LiDAR offers maximum precision.

Used for:

+ Make ready
+ Low-level design
+ Underground utilities mapping

Mobile Terrestrial LiDAR (3D)

This data source is the most expensive and difficult form of data to use (as it requires extensive training) – but it's also the most versatile. If your project volume is large, using Mobile Terrestrial LiDAR is worth it.

Used for:

+ Permitting
+ High-level design
+ Make ready
+ Low-level design
+ Underground utilities mapping

All of the above can be combined with AirWorks for seamless integration into your workflow to yield greater efficiencies.

AirWorks' Data Marketplace

Some projects may benefit from using higher-resolution data over low-resolution satellite imagery, such as Google Earth. Low-resolution satellite imagery often provides you with inaccurate, outdated, and limited data, resulting in heavy reliance on field collection. Using high-resolution Imagery and LiDAR ensures that you have recent, reliable, and geospatially accurate data resulting in more robust basemaps and less time (and money) spent on field collection - unlocking max speed and scalability.

The good news is there are a host of companies working to make widespread, high-quality geospatial aerial imagery and LiDAR data available to all.

Commercially available geospatial data is saving telecom firms time and money and broadening their reach by allowing them to reduce or even skip the hassle of fieldwork and stream or download the geospatial data they need.

Telecom firms are turning more frequently to these types of data sources because of the benefits gained when comparing to technology like Google Earth.

Quality

Get higher-resolution data for precision mapping

Variety

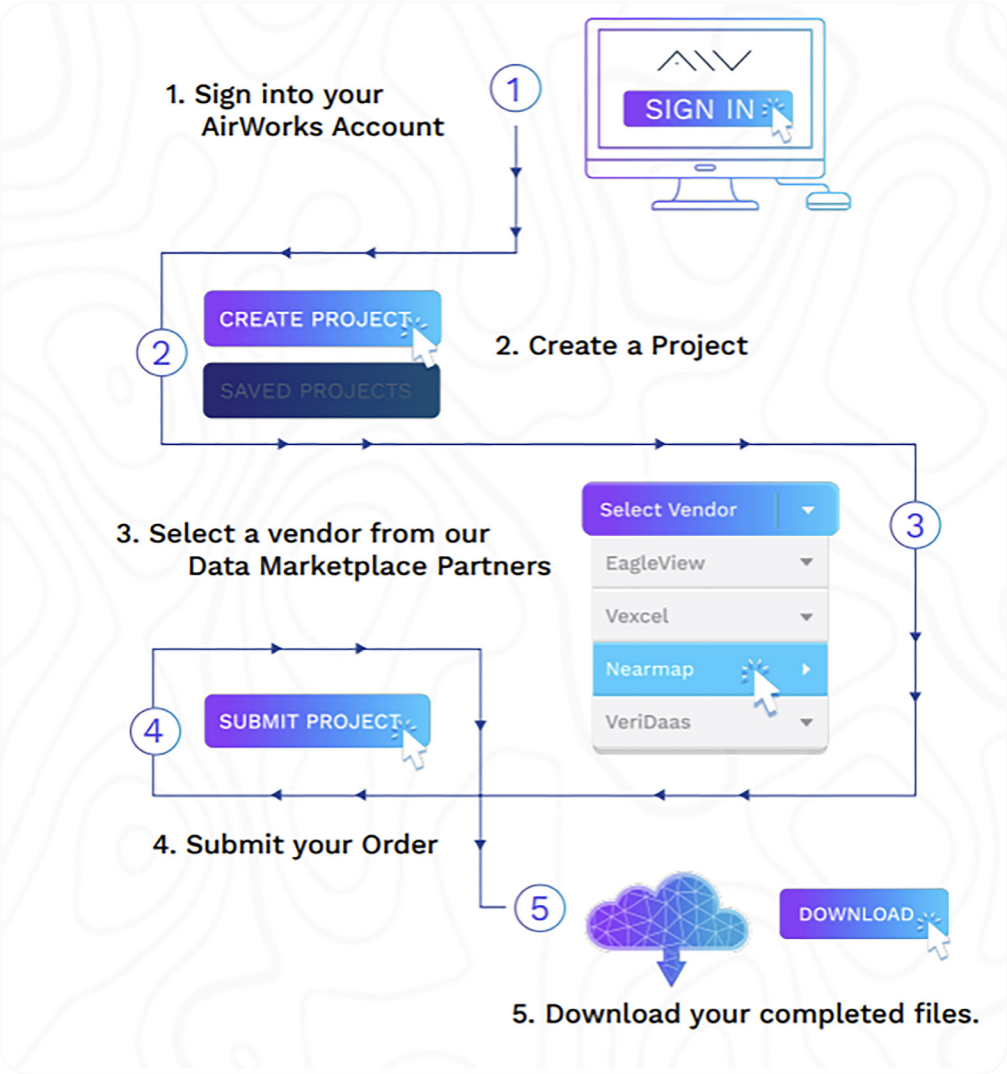
Select the most suitable data type for your specific project needs

Accuracy

Ensure you have the most recent, up-to-date data

The best part? These files can be uploaded directly to AirWorks for fast and accurate AI feature extraction and linework.

The Process



How Telecom Clients Leverage AirWorks

We provide various levels of service, depending on each client's needs and current practices.

If a firm is already utilizing and deploying remote sensing tools, they can engage with AirWorks by purchasing the software only.

However, we can also help with the data collection itself. Together with our data partners, we've established a data marketplace where clients can identify an area of interest, to which we will capture or bring in imagery to help support clients in those data selections.

Lastly, we also offer full service options for clients who need additional support, whether that's additional field work or more specific data collection. In these cases, we're able to bring in those types of data to stack on top of what we have extracted.

Software Only

- Firms already integrating geospatial data
- Data Capture in-house or with partners
- Use AirWorks to streamline base mapping
- Solve labor issues
- Scalability

Data + Software

- Data Collection via AirWorks Marketplace partners
- Imagery & LiDAR
- AI Extraction for aerial & underground use cases
- Leverage AirWorks' expertise in remote sensing

Full Service

- Data Collection, Software, and Field Support
- Imagery & LiDAR
- Poles, Parcels, Addresses, and other field work
- Qualified Clients Only

Our Data Partners

Need to get data fast? Our off-the-shelf geospatial data marketplace is ready to help.

Our data partners give clients the option to use their imagery directly in-app, enabling them to seamlessly submit projects with the best, most up to date data.

We can work with a host of different data providers depending on your use case. In the early stages of your project? Use aircraft data providers from our partners Nearmap or EagleView.

At our core, we remain data-agnostic. We can process data from any commercially available data provider.

Nearmap Vertical

If you're looking for high-resolution, frequently updated orthomosaic aerial imagery in major urban areas, look no further than Nearmap Vertical.

EagleView Reveal

Eagleview Reveal's coverage is impressive, touting 1 billion images in both urban and rural areas, covering 98% of the US population.

Doing more intricate and detailed work, such as pole locates or make ready studies? You may benefit from our full-service offering, where we collect the data for you through one of our partners.

Flexible Features and Layers

We offer different options for features, layers, and attributes that our clients can select depending on the project's specific needs – get the features you need to make your project successful with AirWorks Automate!

We have the **flexibility to work within everyone's needs** – whether that's creating custom processing bundles or customized layers.

Plus, our a-la-carte option lets you handpick only the layers you need so you can get your project back even faster and save on costs in the process.

All of the layers you need for your project are created by our AI and QC'd by our team of humans in Boston.

Take a look at just some of the layers we can include in your order:

- + Utility poles (with details)
- + Overhead wires
- + Transmission pylons
- + Telecom towers
- + Distribution sites
- + Communications cabinets

And more! If you can see it, we can extract it.

Below are some examples of custom offerings for different use cases:

Summary A: Hybrid (Aerial & Underground)

Layer	Type	Attributes	Description
Pole	Point	Unique Identifier	3D
		Pole Height	3D
		Pole Diameter	3D
		Att_Height_1	3D
		Att_Height_2	3D
		Att_Height_3	3D
		Att_Height_4	3D
		Att_Height_5	3D
		Att_Height_6	3D
		Att_Height_7	3D
		Att_Height_8	3D
		Att_Height_9	3D
		Att_Height_10	3D
		Att_Height_11	3D
		Att_Height_12	3D
Midspan	Point	Lowest Height	3D
Anchor	Point		2D
EOP	Polyline		2D
Sidewalk	Polyline		2D
Driveway	Polyline		2D
Building	Polygon		2D

Summary A depicts a deliverable you might get for aerial and underground projects; for instance, when we run extractions on poles.

Summary B: AW Basic Underground

Layer	Type	Attributes	Description
Roads	Polyline		2D
Building	Polyline		2D
Sidewalk	Polyline		2D
Curb	Polyline		2D
Manholes	Point		2D
Catch Basin	Point		2D
Water	Polyline		2D
Vegetation	Polyline		2D
Concrete Pad	Polyline		2D
Pavemark Lines	Polyline		2D

Summary B depicts what our core AI covers; for instance, when we work with manned aircraft imagery.

Summary C: Full Underground

Layer	Type	Attributes	Description
Catch Basin			2D
Manhole			2D
EOP			2D
Curb			2D
Sidewalk			2D
Pavemark Line			2D
Vegetation			2D
Water			2D
Railroad			2D
Culverts			2D
Ditch			2D
Guardrail			2D
Fence			2D
RR Crossing			2D
Fire Hydrant			2D
Poles			2D
Signs			2D
Crosswalk Indicator			2D
RR Crossing (Sign)			2D
Comm Cabinet			2D
Electric Transformer			2D
Traffic Signal			2D
Handholes			2D
Valves			2D

Summary C depicts a deliverable that goes beyond core functionality; for instance, when we have a client working on a low-level design project.

The best part? AirWorks offers special pricing packages to ensure that you maximize cost savings.

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Project Examples

ROW Permit with Mobile LiDAR

When we first started working with LightSett, they were struggling to keep up with a huge workload demand.

AirWorks Automate helped close this gap by force multiplying the amount of engineering miles delivered on a daily basis.

With AirWorks, LightSett went from 3 engineered miles per day to 17+ engineered miles per day.

That's a 30x improvement over the course of one month – without any additional hires.

LightSett

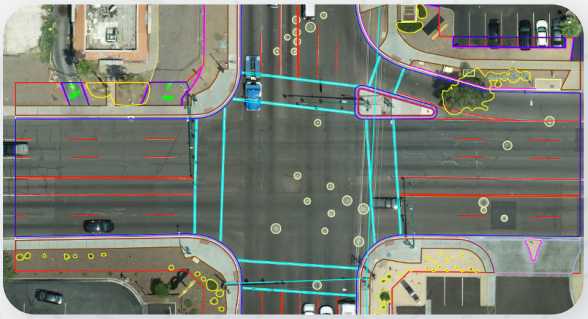
Strand Mapping with UAV

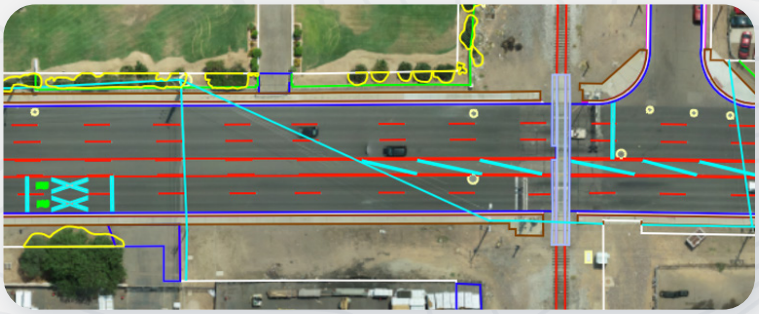
One of our U.S. based clients was working on a strand mapping project covering roughly 4.5 miles using aerial data collected via drone.

While they had already been using drones, they were limited in their ability to complete projects by the amount of staff they had in the office.

With AirWorks, this client was able to cut their drafting time by 70%.

The ability to rapidly create these vectors drove the biggest return on investment.





Tackling the Project Backlog

Another one of our clients was using AirWorks to support them in ROW permitting for underground and utility projects.

Their biggest struggle was tackling a massive backlog as deep as 5 months.

When we started working with them, we identified a common partner in Nearmap. We were able to partner with Nearmap imagery to run extraction for inside the right of way to create basemaps to drive permitting.

With AirWorks, this client was able to completely clear their 5 month backlog.

Afterwards, we were able to develop a tool together in which we could cut down on extraction in areas that weren't being used, enabling our client to deliver a little faster in a more budget-friendly manner.

MasTec
Infrastructure that Delivers

Aerial Make Ready: 3D Linework Delivery

In our final project example, we showcase a client that was moving away from high-level needs for permitting and moving into what we call low-level needs.

Their project was focused on pole extraction or make-readies, which required a slightly different resolution in imagery and a different point cloud density.

With AirWorks, this client was able to extract all the vectors needed from an incredibly dense point cloud in a flash.

The ability to get more accurate data quickly revolutionized our client's data processing timeline.

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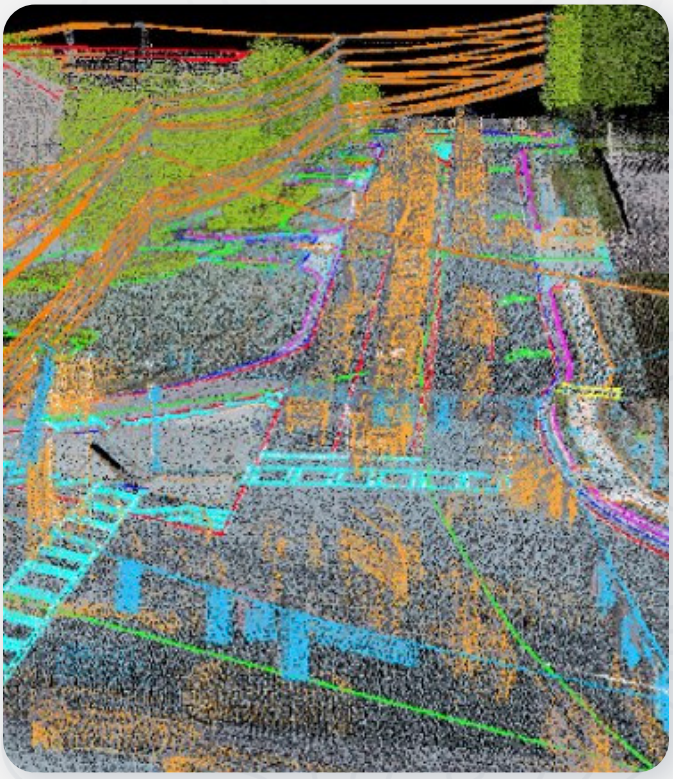

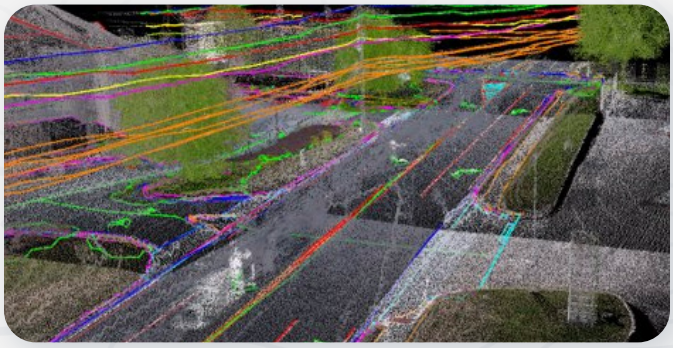

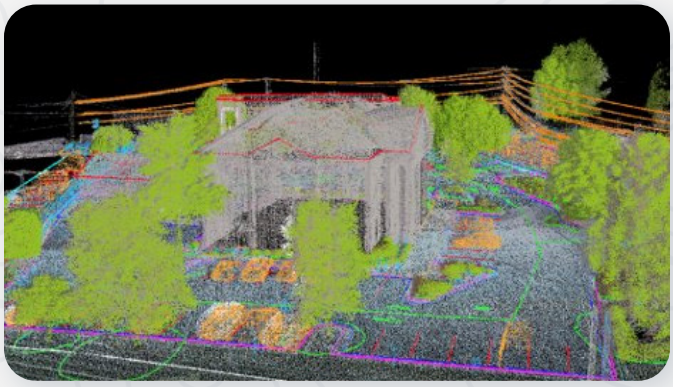

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Get Started Today

Summary: AirWorks Automate

By putting reliable and actionable data in your hands, we give you the tools to deliver more projects, faster.

90+

Customers

3,500+

Projects Delivered

40%

Projects Delivered Ahead of Schedule

4 Days

Average Turnaround Time

We can work with (almost) all types of data:

+ Drone
+ Manned Aircraft
+ LiDAR (Aerial & Mobile)
+ Satellite

Working with AirWorks is fast and easy:

Upload

Bring your own data or easily source it from one of our Data Marketplace partners.

Process

Reduce project costs with better resource allocation by letting AirWorks automate do the tedious work for you.

Deliver

View and download completed, QC'eed files and quickly move on to other project stages.

Flexible Pricing Options

Build the plan you need to get started.

Pay-Per-Project Pricing

Leverage the power of AI & machine learning without the commitment of an annual subscription. Instead, purchase credits as you need them to get the deliverables you need to complete your project.

Pre-Paid Packages

Ideal for teams looking to maximize cost-savings and benefit from a dedicated suport team. Get prices as low as $20/credit by committing to a set number of credits and paying in advance.

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Appendix

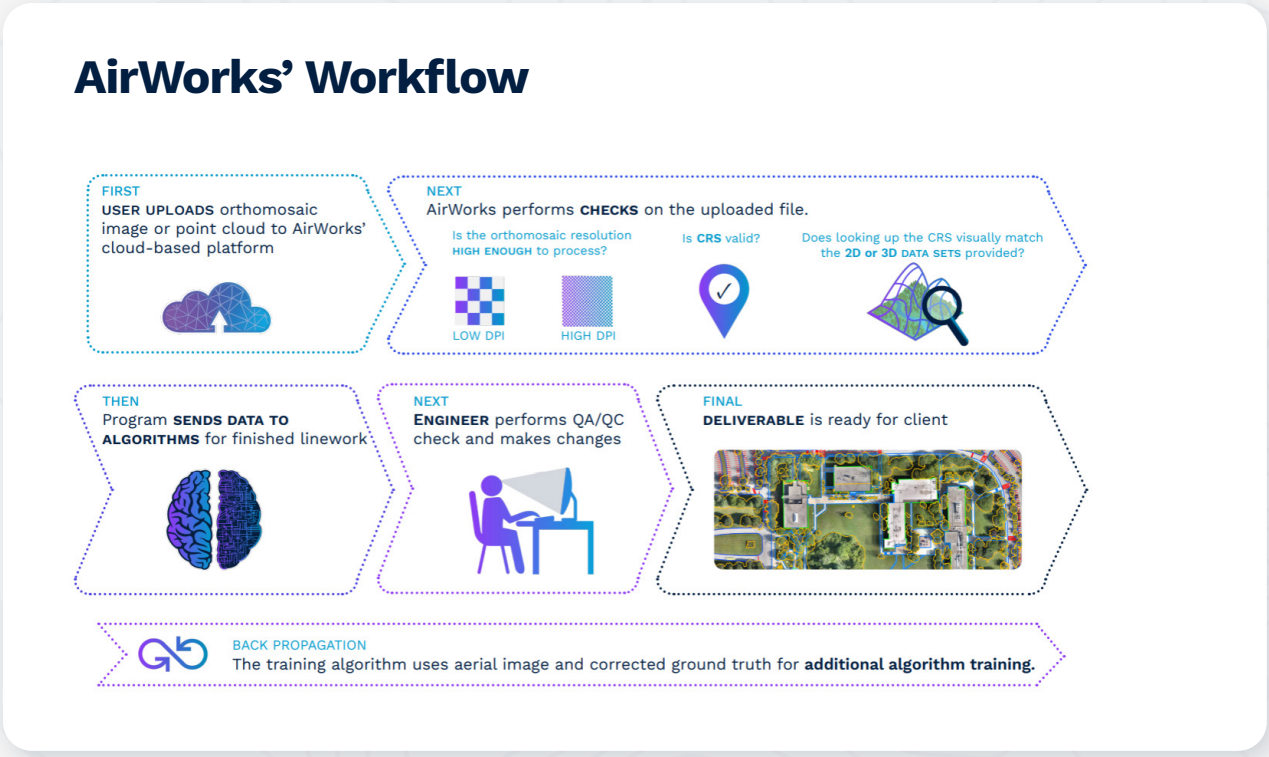
AirWorks' Workflow

At a very high level, AirWorks Automate takes data and then uses our trained algorithms to make sense of the mass amounts of pixels and points within that dataset.

It's fast and easy:

+ A user uploads their data set, whether that's sourced internally or from one of our data partners (more on that later).
+ AirWorks performs various checks, looking at things like the density of points, the resolution of pixels, and proper spatial references.
+ Then, our machine learning algorithms* start to look at the data and segment, classify, and rasterize all of these types of features into the final deliverables needed for the project.
+ Finally, we enter the QA / QC check to ensure the deliverable meets the needs of the client.

*To better understand the mechanics of AI-powered feature extraction, please see the appendix.



AI Basics

Artificial Intelligence (AI) lies at the core of Airworks' feature extraction software, enabling firms to shorten delivery timelines and increase capacity without additional hires.

In a broad sense, AI describes any computer function that mimics human behavior and logic.

We think it's important for you to see what happens in that blackbox so that you can better understand the mechanics of AI-powered feature extraction.

It's not magic. It's not a robot. At the end of the day, it's mathematics and data.

We train our algorithms to break down images into numbers and recognize patterns. When it comes to output, we are committed to delivering the highest level of quality and completeness per your project guidelines. We understand the varied nuances of accuracy requirements and work with you to get your project where it needs to be.

Computer vision, machine learning – all of that is super important to what we do. But at the end of the day, how does it matter to the industry that we serve?

From the start, we wanted to make sure that we were building products that mattered to our clients. Our mission continues to be to provide the data intelligence that powers the built world.

That's what we started out with, and that's what's leading us through. We hope this eBook helps shed some light on the generalized theories of AI and how we leverage it in this space.

Here's to building a more livable world.

Feature Extraction Basics

Feature extraction is the process of **recognizing** and **categorizing** individual components within an image to convert complicated **raw data** into an **understandable** and **manageable** representation.

This method takes a busy image, filters out distractions, connects the dots, and reduces the data down to the critical elements of the original image.

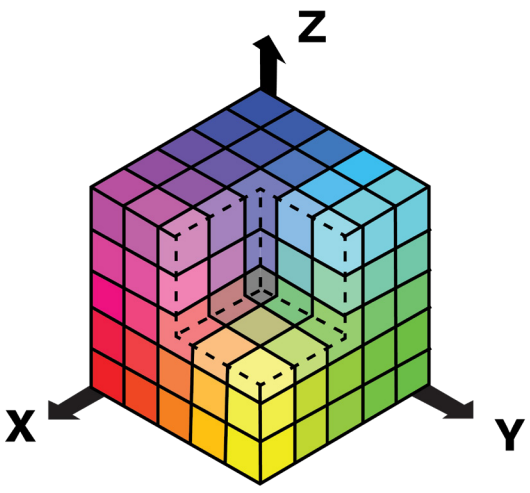
Feature extraction can be done **manually** or through **artificial intelligence (AI)**.

AI feature extraction relies on pixel representation in **RGB color space**. Images are broken down into pixels, and each pixel is one color (some mixture of red, green, and blue). The color is **translated to numbers** in the RGB color space so it can be **interpreted by the algorithm**.

Algorithms are **trained to recognize** groups of pixels as **specific features**. As the program sees more and more data, it begins to recognize a wider range of features within the category and **make connections on features** that are often seen together.

Eventually, the goal is for the **deep learning algorithm** to correctly make predictions about features it may have never specifically seen.

The Human Eye Sees



Digitally, this can be broken down into a 3d coordinate space, with red, green, and blue on separate axes and having a range of 0 to 255 (one byte).

Setting the value of all color channels to 0 creates black (no light emitted), while setting the value of all color channels to 255 creates white (maximum light emitted).

Combinations in between create the variety of colors we see and make these colors recognizable to algorithms through numbers.