Data Science Career Transition Plan

From Astrophysics Post-Doc to Munich Industry (2026–2028)

Background: PhD in Astrophysics, 10+ can years post-doc experience with hydrodynamical simulations, numerical modeling, and large-scale data analysis.

Target: Data Scientist position at a Munich-based company (automotive, tech, insurance, or deep-tech startup).

Timeline: 24 months alongside current position.

Phase 1: Foundations (Months 1–6)

January 2026 – June 2026

SQL Mastery (Priority: Critical)

Your biggest gap as a physicist—industry uses relational databases, not HDF5/FITS files.

Resource	Type	Cost	Duration
Mode Analytics SQL Tutorial	Free course	€0	2 weeks
DataCamp SQL Fundamentals	Track	€25/month	4 weeks
LeetCode SQL Problems	Practice	Free	Ongoing

Milestone: Complete 50+ SQL problems, build a project querying real datasets.

Software Engineering Practices (Priority: Critical)

Move beyond Jupyter notebooks to production-quality code.

- ☐ Git workflow: branching, pull requests, code review
- ☐ Python project structure: `pyproject.toml`, virtual environments
- ☐ Testing: pytest basics, CI/CD with GitHub Actions
- ☐ Documentation: docstrings, README standards

Resource: Real Python - Python Project Best Practices

ML Refresher (Priority: Medium)

Formalize knowledge you likely already have intuitively.

☐ Scikit-learn official tutorials (2 weeks)
☐ Hands-On ML with Scikit-Learn (Aurélien Géron) — Chapters 1-8
☐ Complete 2 Kaggle "Getting Started" competitions

Phase 2: Deep Learning & Certification (Months 7–12)

July 2026 – December 2026

Deep Learning Specialization (Priority: Critical)

Provider: DeepLearning.AI via Coursera
Cost: ~€42/month (Coursera Plus)
Duration: 3 months @ 10 hrs/week

Courses:

1. Neural Networks and Deep Learning
2. Improving Deep Neural Networks
3. Structuring ML Projects
4. Convolutional Neural Networks
5. Sequence Models

Why: Industry-standard credential, taught by Andrew Ng, highly recognized in German market.

Azure Data Scientist Associate (DP-100)

Exam Cost: ~€165
Prep Time: 6-8 weeks

Study resources:

☐ Microsoft Learn: DP-100 learning path (free)
☐ Azure ML documentation
☐ Practice exams on MeasureUp

Why: Azure dominates German enterprise (BMW, Siemens, Allianz all use it heavily). This is the highest-value certification for Munich market.

Phase 3: MLOps & Cloud (Months 13–18)

January 2027 – June 2027

MLOps Fundamentals

Learn to deploy and monitor models in production.

Skill	Resource	Priority
Docker	[Docker for Data Science](#)	High
MLflow	[MLflow documentation](#)	High
Kubernetes basics	Intro course only	Medium
CI/CD for ML	GitHub Actions + DVC	Medium

Cloud Platform Deep Dive

Build on Azure certification with hands-on projects:

- ☐ Deploy a model as Azure ML endpoint
- ☐ Set up automated retraining pipeline
- ☐ Implement model monitoring and drift detection

Optional: Databricks

Very popular in German enterprise—consider Databricks Lakehouse Fundamentals (free certification).

Phase 4: Job Search & Specialization (Months 19–24)

July 2027 – December 2027

Active Networking

☐ Attend 3+ appliedAI Initiative events (connects to BMW, Siemens, Infineon)
☐ Join Data Science Munich Meetup
☐ Attend PyMunich monthly
☐ Engage on LinkedIn with German market keywords

LinkedIn Optimization

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Headline: Data Scientist | PhD Astrophysics | ML & Simulation Expert
          Datenwissenschaftler | ML & Simulation

Summary: 10+ years analyzing terabyte-scale datasets and building
numerical simulations for astrophysical systems. Transitioning from
academic research to industry data science. Expert in Python,
statistical modeling, physics-informed machine learning, and
computational fluid dynamics. Strong background in aerospace-relevant
disciplines: orbital mechanics, hydrodynamics, and high-performance
computing.

Skills: Python, SQL, Machine Learning, Azure ML, PyTorch,
scikit-learn, Data Visualization, Numerical Simulation, CFD,
Physics-Informed Neural Networks (PINNs)
```

Target Companies (Munich)

Sector	Companies	Language Req.
Aerospace	Airbus Defence & Space, OHB System, MT Aerospace, IABG, Lilium	English OK (often international teams)
Tech Giants	Google, Microsoft, Amazon, NVIDIA	English OK
Automotive	BMW, Audi, Continental, Infineon	Often German B2+
Deep Tech	Celonis, inovex, ClimatePartner	Usually English OK
Insurance	Allianz, Munich Re	Often German B2+
Research	Fraunhofer, Max Planck Digital, DLR Institute	English OK

Salary Expectations (Munich)

Level	Annual Gross
Entry (career changer)	€49,000 – €57,000
Mid-level (2-3 yrs)	€57,000 – €68,000
Senior	€70,000 – €90,000+

Recruitment Agencies

- Hays Technology
- Computer Futures
- Michael Page
- Robert Half

Aerospace Industry Focus

Why Your Background is Perfect for Aerospace Data Science

Your astrophysics PhD and hydrodynamical simulation experience directly translates to aerospace applications:

Your Expertise	Aerospace Application	Companies
Hydrodynamic simulations	Computational Fluid Dynamics (CFD), aerodynamics	Airbus, OHB, IABG
N-body problems	Satellite constellation design, trajectory optimization	OHB System, ESA contractors
Large-scale data analysis	Sensor fusion, telemetry analysis, predictive maintenance	All aerospace companies
Numerical optimization	Flight path planning, fuel optimization, mission design	Airbus, MT Aerospace
Statistical modeling	Uncertainty quantification, reliability engineering	Aerospace quality assurance

Key Munich Aerospace Companies

1. Airbus Defence & Space (Ottobrunn/Taufkirchen)

- **Focus:** Satellites, military aircraft, cybersecurity
- **DS Roles:** Satellite data analysis, autonomous systems, digital twins
- **Language:** English sufficient (international environment)
- **Your Angle:** CFD experience, orbital mechanics knowledge

2. OHB System AG (Oberpfaffenhofen/Munich)

- **Focus:** Small satellites, space systems, scientific missions
- **DS Roles:** Mission planning, telemetry analysis, ML for satellite operations
- **Language:** English sufficient
- **Your Angle:** Direct astrophysics application, simulation expertise

3. MT Aerospace (Bavaria operations)

- **Focus:** Rocket structures, cryogenic tanks, launch systems
- **DS Roles:** Manufacturing optimization, structural analysis
- **Language:** German helpful
- **Your Angle:** Physics modeling, optimization algorithms

4. IABG (Ottobrunn)

- **Focus:** Aerospace testing, simulation, systems engineering
- **DS Roles:** Test data analysis, simulation validation, digital engineering
- **Language:** German helpful
- **Your Angle:** Simulation expertise directly applicable

5. Lilium (Munich/Weßling)

- **Focus:** Electric vertical take-off jets (eVTOL)
- **DS Roles:** Flight control algorithms, battery optimization, sensor fusion
- **Language:** English OK (startup environment)
- **Your Angle:** Numerical methods, real-time optimization

6. DLR Institute (German Aerospace Center) (Oberpfaffenhofen)

- **Focus:** Space research, aviation, energy
- **DS Roles:** Research-to-industry bridge, Earth observation data
- **Language:** English OK
- **Your Angle:** Academic background valued, simulation experience

Aerospace-Specific Skills to Highlight

Technical: - Computational Fluid Dynamics (CFD) - analogous to your hydro simulations - Orbital mechanics and astrodynamics - direct knowledge transfer - Physics-informed neural networks (PINNs) - hot topic in aerospace - Uncertainty quantification - critical for aerospace safety - High-performance computing (HPC) - aerospace relies heavily on this - Sensor fusion and Kalman filtering - for navigation/tracking

Domain Knowledge: - Familiarity with aerospace standards (mention if you know ISO or similar) - Understanding of mission design constraints - Experience with large-scale distributed simulations - Knowledge of gravitational systems (N-body) - Fluid dynamics fundamentals

Aerospace Portfolio Projects Priority

1. **Essential:** Trajectory optimization project (demonstrates orbital mechanics)
2. **Essential:** CFD-to-ML surrogate model (shows aerospace simulation knowledge)
3. **Valuable:** Satellite telemetry anomaly detection
4. **Valuable:** Physics-informed model for atmospheric reentry prediction

Aerospace Networking Opportunities

Event/Community	Focus	Location
Space Tech Expo Europe	Annual conference	Munich (November)
DLR Open Days	Public events, networking	Oberpfaffenhofen
ILA Berlin Air Show	Major aerospace event	Berlin (biennial)
Munich Aerospace e.V.	Industry consortium	Munich region
ESA BIC Bavaria	Space startup incubator	Networking events

Aerospace-Relevant Certifications

Consider adding: - **MATLAB/Simulink:** Still widely used in aerospace (especially Airbus) - **ROS (Robot Operating System):** For autonomous systems (Lilium) - **AWS for Aerospace & Satellite:** Specialized cloud certification

CV Adjustments for Aerospace Applications

Translate Your Experience:

"Developed hydrodynamical simulation code for protoplanetary disks"
"Developed computational fluid dynamics simulations for multi-phase flow systems with 10M+ grid points"

"Analyzed observational data from radio telescopes"
"Built automated pipelines for large-scale sensor data analysis and anomaly detection"

"Published research on planetary formation"
"Applied N-body numerical methods to complex gravitational systems requiring high-precision orbit integration"

GitHub Portfolio Strategy

Repository Structure

```
data-science-portfolio/
  01-sql-analytics/
    retail-sales-analysis/
    customer-segmentation/
  02-physics-to-industry/
    hydrosim-predictive-maintenance/     Showcase project
    anomaly-detection-fraud/
    numerical-optimization-supply-chain/
  03-deep-learning/
    image-classification-manufacturing/
    time-series-forecasting/
  04-mlops/
    azure-ml-deployment/
    mlflow-experiment-tracking/
  05-domain-projects/
    aerospace-trajectory-optimization/
    cfd-ml-surrogate-models/
    automotive-sensor-analysis/
    insurance-risk-modeling/
```

High-Impact Projects Leveraging Physics Background

Project 1: Physics-Informed Predictive Maintenance

Concept: Adapt hydrodynamic simulation methods to model industrial equipment degradation.
Tech: Python, scikit-learn, PyTorch, time-series analysis
Appeal: Automotive (BMW), manufacturing

Project 2: Cosmology Anomaly Detection → Fraud Detection

Concept: Transfer outlier detection techniques from cosmic surveys to financial transactions.
Tech: Python, imbalanced-learn, isolation forests
Appeal: Insurance (Allianz, Munich Re), fintech

Project 3: N-body Methods for Traffic Flow

Concept: Adapt particle simulation for autonomous vehicle trajectory prediction.
Tech: Python, numerical methods, visualization
Appeal: Automotive R&D

Project 4: HPC Pipeline → Cloud MLOps

Concept: Document migration from SLURM-based HPC workflows to Kubernetes/Azure ML.
Tech: Docker, Azure ML, MLflow, GitHub Actions
Appeal: Tech companies, demonstrates industry readiness

Project 5: Orbital/Flight Trajectory Optimization

Concept: Apply N-body simulation techniques to satellite trajectory planning or drone path optimization.
Tech: Python, scipy.optimize, numerical integration, 3D visualization
Appeal: Aerospace (Airbus, OHB, Lilium), autonomous systems

Project 6: CFD Analysis → Aerodynamic ML Surrogate Models

Concept: Build ML models to predict aerodynamic forces (lift/drag) from geometry, replacing expensive CFD simulations.
Tech: PyTorch, physics-informed neural networks (PINNs), mesh processing
Appeal: Aerospace R&D, automotive aerodynamics, digital twins

Project Checklist (Each Repo)

☐ Clear README with problem statement, approach, results
☐ Well-documented code with docstrings
☐ Requirements file or pyproject.toml
☐ Unit tests
☐ Visualizations of results
☐ Link to blog post or writeup (optional but valuable)

Certification Priority Order

Priority	Certification	When	Cost
1	Deep Learning Specialization	Month 7-9	~€125
2	Azure Data Scientist Associate (DP-100)	Month 10-12	~€165
3	Databricks Lakehouse Fundamentals	Month 14	Free
4	Optional: AWS ML Specialty	Month 16	~€300

German Language Considerations

Target Employer	Requirement
Google, NVIDIA, Celonis	English sufficient
BMW, Allianz (permanent)	German B2+ often required
Startups	Usually English OK

Recommendation: If not already proficient, invest in reaching B1-B2 level:

☐ Goethe-Institut course (structured)
☐ iTalki tutors (flexible, conversation-focused)
☐ Deutsche Welle free resources

Monthly Checklist Template

Month: _____

Learning:

- ☐ Course/certification progress: _____
- ☐ Hours studied this month: _____

Portfolio:

- ☐ GitHub commits this month: _____
- ☐ Project milestones completed: _____

Networking:

- ☐ Meetups/events attended: _____
- ☐ LinkedIn connections made: _____
- ☐ Informational interviews: _____

Job Search (Phase 4):

- ☐ Applications submitted: _____
- ☐ Interviews: _____
- ☐ Feedback/learnings: _____

Key Resources Quick Reference

Category	Resource	Link
SQL	Mode Analytics	mode.com/sql-tutorial
ML	Scikit-learn docs	scikit-learn.org
DL	DeepLearning.AI	coursera.org/deeplearning-ai
Azure	Microsoft Learn	learn.microsoft.com
Practice	Kaggle	kaggle.com
Jobs	StepStone	stepstone.de
Networking	appliedAI	appliedai.de
Meetups	Data Science Munich	meetup.com

Success Metrics

End of Year 1 (Dec 2026):

☐ SQL proficiency demonstrated (portfolio project)
☐ Deep Learning Specialization complete
☐ Azure DP-100 certified
☐ 3+ GitHub projects published
☐ 1 Kaggle competition completed

End of Year 2 (Dec 2027):

☐ 6+ polished GitHub projects
☐ Active in Munich data science community
☐ 50+ targeted job applications
☐ Job offer secured

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