RainfallFussion - Quick Reference Guide

Version: 1.0 | **Status:** Production Ready | **Updated:** Februari 2025

Project Package Contents

Your RainfallFussion project includes:

Application Files

- **index.html** - Main web application (1239 lines, self-contained)
- **desktop.ini** - Folder configuration

Documentation Files (7 files)

1. **INDEX.md** - Documentation index & navigation guide
2. **README.md** - Complete documentation (most important!)
3. **QUICK_START.md** - 5-minute getting started guide
4. **TECHNICAL.md** - Code architecture & algorithm details
5. **DATA_FORMAT.md** - Data input specifications & examples
6. **FAQ.md** - 30+ questions & answers with troubleshooting
7. **CITATION.md** - Citation guide for academic & professional use

Start in 5 Minutes

Step 1: Open Application (30 seconds)

```
# Option A: Direct (simplest)
Double-click: index.html

# Option B: Local Server (recommended)
python -m http.server 8000
→ Open browser → http://localhost:8000

```text

### Step 2: Prepare Data (2 minutes)

Three Excel files needed:

- Target.xlsx (station to fill)
- Ref1.xlsx (reference 1)
- Ref2.xlsx (reference 2)

**File format:** Excel 2007+ (.xlsx)

```text
```

```
Header: Year | Day | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct |
Nov | Dec
Data:   2020 | 1   | 12.5| 15.3| 20.1| 18.5| 22.3| ... | 28.9| 26.3| 23.1| 19.8|
16.5| 14.2
```

```text

### Step 3: Input Coordinates (1.5 minutes)

```text
Target Station:  Lat: -7.5515  Lon: 110.8243
Reference 1:     Lat: -7.5600  Lon: 110.8100
Reference 2:     Lat: -7.5400  Lon: 110.8400
```

```text

### Step 4: Process & Download (1 minute)

1. Upload 3 files → Click PROCESS DATA
2. Wait for progress bar 100%
3. Click DOWNLOAD HASIL
4. Done!

☑ Total time: 5 minutes

---

## 🎯 Which Document To Read?

| Need              | Read              | Time      |
|-------------------|-----------  ------|------------ |
| Just use it       | QUICK_START.md    | 5 min     |
| Full understanding| README.md         | 20 min    |
| Fix data errors   | DATA_FORMAT.md    | 15 min    |
| Troubleshoot issues| FAQ.md           | 10-30 min |
| Understand code   | TECHNICAL.md      | 30 min    |
| Citation formats  | CITATION.md       | 10 min    |
| Navigate all docs | INDEX.md          | 5 min     |

---

## 🔧 Installation Quick Tips

### Windows

```bash
python -m http.server 8000
→ http://localhost:8000/index.html
```

```text

### Mac/Linux

```bash
```
```

```
python3 -m http.server 8000
→ http://localhost:8000/index.html

```text

### No Python?

```bash
Node: npx http-server
Just open: index.html directly (may have limits)
Docker: docker run -p 8000:80 -v path:/app httpd

```text

---

## 📊 Data Format - Quick Check

### ☑ CORRECT Format

```text
Year | Day | Jan   | Feb   | Mar
2020 | 1   | 12.5  | 15.3  | 20.1
2020 | 2   |       | 14.2  | 19.8      ← Blank = Missing
2020 | 3   | 11.2  | 13.5  | 18.9

```text

### ❌ WRONG Formats

```text
Year | Day | January | February    ← Month names too long
2020 | 1   | N/A     | 15.3        ← Text "N/A" invalid
2020 | 2   | -5.0    | 14.2        ← Negative invalid
2020 | 3   |         | 13.5        ← Missing gap in year

```text

### Data Requirements

- Format: `.xlsx` (Excel 2007+)
- Header: Exactly as shown above
- Missing: Leave BLANK (empty cell)
- Values: Non-negative numbers
- Minimal: 365+ rows recommended

---

## 📈 Understanding Results

### Four Imputation Methods

1. **Normal Ratio Method (NRM)** - uses annual mean ratios
2. **Inverse Distance Weighting (IDW)** - proximity-weighted
```
```

```
3. **Linear Regression (LR)** - mathematical relationship
4. **Correlation Weighting (CW)** - correlation-based

→ **Voting Ensemble:** Average of valid predictions

### Key Metrics

| Metric     | Good  | Meaning                    |
|------------|-------|----------------------------|
| **RMSE**   | < 5 mm| Average error magnitude    |
| **MAPE**   | < 15% | Percentage error           |
| **NSE**    | > 0.75| Model efficiency           |
| **r**      | > 0.80| Correlation strength       |

**All good → Use confidently!**
**Some poor → Check data quality**
**All poor → Try different reference stations**

---

## 🆘 Common Issues & Quick Fixes

### "File cannot be read"→ Check file is .xlsx, not .xls or .csv

→ Open file, save as Excel Workbook (.xlsx)
→ Check header row: Year, Day, Jan-Dec (exact)

### "Process is very slow"

→ Reduce data to 365-1095 rows
→ Try Chrome browser (faster)
→ Close other browser tabs

### "Results have value 0"

→ Check in Excel if imputed or original
→ Review method comparison columns
→ May be valid "no rain" value

### "NSE is negative or very low"

→ Reference stations aren't suitable
→ Data quality issue → check for outliers
→ Try different reference stations

### "Download file corrupted"

→ Try different browser
→ Clear browser cache (Ctrl+Shift+Delete)
→ Re-run process & download again

**More issues?** → See FAQ.md

---
```

````
## 🔢 Algorithm Overview

### Quick Math

**Normal Ratio Method:**

```text
Value = (Station_Target_Mean / Station_Ref_Mean) × Ref_Value

```text

**Inverse Distance Weighting:**

```text
Value = (V1/d1² + V2/d2²) / (1/d1² + 1/d2²)
Where d = distance (km)

```text

**Linear Regression:**

```text
Value = a + b × Reference_Value

```text

**Correlation Weighting:**

```text
Value = (|r1| × V1 + |r2| × V2) / (|r1| + |r2|)
Where r = correlation coefficient

```text

**Final Ensemble:**

```text
Imputed_Value = Average(Valid_Methods)

```text

---

## 🎓 Feature Comparison

| Feature              | Support | Notes                       |
|----------------------|---------|-----------------------------|
| Daily rainfall       | ✓       | Full support                |
| Monthly aggregates   | ✓       | Can do post-process         |
| 3 stations (1+2)     | ✓       | Designed for this           |
| Multi-station        | ✗       | Process one at a time       |
| Offline              | ✓       | After first load            |
| Mobile               | ✓       | Limited, responsive         |
````

```
| Batch process        | ✗      | Manual only              |
| Export Excel         | ✓      | Main export format       |
| Export CSV           | ⚠      | Via Excel conversion     |
| Cloud                | ✓      | Deployable               |

---

## 📋 Quality Checklist

Before uploading data, verify:

```text
Data Format:
☐ File extension: .xlsx
☐ Header row correct: Year | Day | Jan ... Dec
☐ All values numeric (no text like "N/A")
☐ Missing data: BLANK cells only
☐ No negative values
☐ No extreme outliers (> 500 mm unusual)

Data Volume:
☐ Minimal 5 rows (ideally 365+ for 1 year)
☐ Contiguous data (no empty row gaps)
☐ Target: ≥30% complete
☐ Ref1 & Ref2: ≥80% complete

Coordinates:
☐ Latitude: -90 to +90
☐ Longitude: -180 to +180
☐ Accuracy: ±0.01° preferred
☐ Same coordinate system (decimal degrees)

```text

---

## 💻 System Requirements

### Minimum

- Browser: Chrome 90+, Firefox 88+, Safari 14+, Edge 90+
- RAM: 512 MB
- Storage: 50 MB (for libraries)
- Internet: Only for first load (library download)

### Recommended

- Modern Chrome or Edge browser
- 4+ GB RAM
- SSD storage
- Stable internet (1+ Mbps)

### Tested Data Volume
```

```
- Up to 7300 rows (20 years × 365 days)
- Processing time: < 1-2 seconds
- File size: < 2 MB

---

## 📞 Support Path

**Problem Solving Order:**

1. **Self-help** - Read relevant documentation
2. **FAQ.md** - Search for your question
3. **F12 Console** - Check error details
4. **Contact Admin** - FFWS SURAKARTA team

**When contacting support, provide:**

- Error message (copy from F12 console)
- Steps to reproduce
- Sample data (anonymized if sensitive)
- Browser version & OS
- Screenshots if helpful

---

## 📑 Documentation Map

```text
START HERE
    ↓
[Want quick start?] → QUICK_START.md
[Want full guide?] → README.md
[Have error?] → FAQ.md
[Prepare data?] → DATA_FORMAT.md
[Code/algorithm?] → TECHNICAL.md
[Navigate all?] → INDEX.md

```text

---

## 🎯 Use Cases

### Operational Forecasting

- Input: Latest station data
- Process: Impute missing recent data
- Output: Use for flood prediction models
- Requirement: NSE > 0.75 recommended

### Research & Analysis

- Input: Historical data (5+ years)
- Process: Full quality validation
```

```
- Output: Publish methodology & results
- Requirement: Document all assumptions

### Data Quality Assurance

- Input: Original data + imputed
- Process: Compare & validate
- Output: QA report with metrics
- Requirement: Cross-check with human

### Education & Training

- Input: Sample data
- Process: Learn methodology
- Output: Understand statistical imputation
- Requirement: Read documentation

---

## 🌍 Geographic Context

**For Surakarta (FFWS SURAKARTA):**

- Standard Coordinates: ~7.5°S, 110.8°E
- Tropical Climate: High rainfall variability
- Monsoon Patterns: Dry/Wet seasons important
- Reference Stations: Nearby POS/BMKG stations key

---

## 📝 Version Information

### RainfallFussion v1.0

- Release Date: Februari 2025
- Status: Production Ready
- Organization: FFWS SURAKARTA
- Maintenance: Active

### Browser Compatibility

- Chrome: ✓ 90+
- Firefox: ✓ 88+
- Safari: ✓ 14+
- Edge: ✓ 90+
- IE: ✗ Not supported

### Known Limitations

- Single imputation (3 stations max)
- Daily level only (hourly not supported)
- No batch automation (manual process)
- Client-side processing (size limited)
```

```
---

## 🔒 Data Privacy & Security

**Your Data Protection:**

- ✓ No data sent to internet
- ✓ All processing local only
- ✓ No server storage
- ✓ No tracking or analytics
- ✓ Safe for confidential data

**Best Practice:**

- Backup original data
- Store results securely
- Document assumptions
- Validate quality regularly

---

## ✨ Key Features Summary

1. ⚡ **Fast** - Process < 2 seconds for typical data
2. 🎯 **Accurate** - 4-method ensemble voting
3. 🔍 **Validated** - 5 comprehensive metrics
4. 📊 **Visual** - Charts & metrics displays
5. 📥 **Integrated** - Excel import/export
6. 🌐 **Web-based** - No installation needed
7. 🔐 **Secure** - Local processing only
8. 🆓 **Free** - No licensing costs

---

## 🚀 Next Steps

**Ready to use?**
1. ☑ Read QUICK_START.md (5 min)
2. ☑ Prepare Excel data (following DATA_FORMAT.md)
3. ☑ Run application (open index.html)
4. ☑ Upload coordinates & files
5. ☑ Click PROCESS & download results

**Have questions?**
→ Check FAQ.md (30+ Q&A)

**Need something changed?**
→ Contact FFWS SURAKARTA admin

**Want to understand code?**
→ Read TECHNICAL.md

---
```

````
## 📌 Important Links

| Resource           | Location          |
|--------------------| ------------------|
| Application        | index.html        |
| Main Docs          | README.md         |
| Quick Start        | QUICK_START.md    |
| Data Details       | DATA_FORMAT.md    |
| Q&A                | FAQ.md            |
| Code Reference     | TECHNICAL.md      |
| Navigation         | INDEX.md          |
| This Guide         | REFERENCE.md      |
| Citation Guide     | CITATION.md       |

---

## 📊 Quick Metrics Interpretation

```text
Perfect Results:
RMSE < 3 mm, MAPE < 10%, NSE > 0.85, r > 0.90

Good Results:
RMSE < 5 mm, MAPE < 15%, NSE > 0.75, r > 0.80 ✓ USE

Acceptable Results:
RMSE < 8 mm, MAPE < 20%, NSE > 0.50, r > 0.70
⚠ Use with caution, validate manually

Poor Results:
RMSE > 10 mm, MAPE > 30%, NSE < 0.50, r < 0.70
✗ Do not use, try different reference stations

```text

---

## 🎓 Formula Sheet

**Pearson Correlation:**
- r = Σ(X-X̄)(Y-Ȳ) / √[Σ(X-X̄)² × Σ(Y-Ȳ)²]
- Range: -1 to +1 (higher = stronger relationship)

**RMSE:**
- RMSE = √(Σ(Observed - Predicted)² / n)
- Unit: mm (same as rainfall)

**MAE:**
- MAE = Σ|Observed - Predicted| / n
- Unit: mm

**MAPE:**
- MAPE = (100/n) × Σ|O - P| / O
- Unit: % (percentage)
````

```
**NSE:**
- NSE = 1 - (Σ(O - P)² / Σ(O - Ō)²)
- Range: -∞ to 1 (1 = perfect)

---

## 🔆 Pro Tips

1. **Best Practice:** Use 3+ years data for validation
2. **Reference Stations:** Choose < 15 km distance
3. **Data Quality:** Remove obvious outliers first
4. **Quality Check:** Manually review ~10% of results
5. **Backup:** Always backup original data
6. **Documentation:** Keep processing notes
7. **Seasonal:** Account for monsoon patterns
8. **Comparison:** Test with different references

---

**Last Updated:** Februari 2025
**Maintained by:** FFWS SURAKARTA
**Support:** Admin Team

---

## Ready to Impute Rainfall Data?

Start with QUICK_START.md! 🌧️
```