

# Package ‘PolyTrend’

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**Title** Trend Classification Algorithm

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**Description** This algorithm classifies the trends into linear, quadratic, cubic, concealed and no-trend types. The “concealed trends” are those trends that possess quadratic or cubic forms, but the net change from the start of the time period to the end of the time period hasn’t been significant. The “no-trend” category includes simple linear trends with statistically in-significant slope coefficient.

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ex.a

*Site 1*

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**Description**

Example of a cubic trend (Site 1, Jamali et al. 2014)

**Usage**

```
data("ex.a")
```

**Format**

The format is: num [1:25] 0.477 0.526 0.52 0.571 0.554 ...

**Source**

Jamali S, Seaquist J, Eklundh L, Ardö J (2014). Automated mapping of vegetation trends with polynomials using NDVI imagery over the Sahel. *Remote Sensing of Environment*, 141, 79-89. <http://dx.doi.org/10.1016/j.rse.2013.10.019>

**Examples**

```
data(ex.a)
## maybe str(ex.a) ; plot(ex.a) ...
```

---

ex.b

*Site 2*

---

**Description**

Example of a cubic trend (Site 2, Jamali et al. 2014)

**Usage**

```
data("ex.b")
```

**Format**

The format is: num [1:25] 0.254 0.267 0.184 0.22 0.208 ...

**Source**

Jamali S, Seaquist J, Eklundh L, Ardö J (2014). Automated mapping of vegetation trends with polynomials using NDVI imagery over the Sahel. *Remote Sensing of Environment*, 141, 79-89. <http://dx.doi.org/10.1016/j.rse.2013.10.019>

**Examples**

```
data(ex.b)
## maybe str(ex.b) ; plot(ex.b) ...
```

---

ex.c

*Site 3*

---

**Description**

Example of a concealed trend with cubic form (Site 3, Jamali et al. 2014)

**Usage**

```
data("ex.c")
```

**Format**

The format is: num [1:25] 0.712 0.726 0.736 0.723 0.739 ...

**Source**

Jamali S, Seaquist J, Eklundh L, Ardö J (2014). Automated mapping of vegetation trends with polynomials using NDVI imagery over the Sahel. *Remote Sensing of Environment*, 141, 79-89. <http://dx.doi.org/10.1016/j.rse.2013.10.019>

**Examples**

```
data(ex.c)
## maybe str(ex.c) ; plot(ex.c) ...
```

---

ex.d

*Site 4*

---

**Description**

Example of a concealed trend with cubic form (Site 4, Jamali et al. 2014)

**Usage**

```
data("ex.d")
```

**Format**

The format is: num [1:25] 0.6 0.54 0.447 0.478 0.457 ...

**Source**

Jamali S, Seaquist J, Eklundh L, Ardö J (2014). Automated mapping of vegetation trends with polynomials using NDVI imagery over the Sahel. *Remote Sensing of Environment*, 141, 79-89. <http://dx.doi.org/10.1016/j.rse.2013.10.019>

**Examples**

```
data(ex.d)
## maybe str(ex.d) ; plot(ex.d) ...
```

---

ex.e

*Site 5*

---

**Description**

Example of a quadratic trend (Site 5, Jamali et al. 2014)

**Usage**

```
data("ex.e")
```

**Format**

The format is: num [1:25] 0.26 0.278 0.196 0.224 0.261 ...

**Source**

Jamali S, Seaquist J, Eklundh L, Ardö J (2014). Automated mapping of vegetation trends with polynomials using NDVI imagery over the Sahel. *Remote Sensing of Environment*, 141, 79-89. <http://dx.doi.org/10.1016/j.rse.2013.10.019>

**Examples**

```
data(ex.e)
## maybe str(ex.e) ; plot(ex.e) ...
```

---

ex.f

*Site 6*

---

**Description**

Example of a quadratic trend (Site 6, Jamali et al. 2014)

**Usage**

```
data("ex.f")
```

**Format**

The format is: num [1:25] 0.327 0.259 0.212 0.298 0.248 ...

**Source**

Jamali S, Seaquist J, Eklundh L, Ardö J (2014). Automated mapping of vegetation trends with polynomials using NDVI imagery over the Sahel. *Remote Sensing of Environment*, 141, 79-89. <http://dx.doi.org/10.1016/j.rse.2013.10.019>

**Examples**

```
data(ex.f)
## maybe str(ex.f) ; plot(ex.f) ...
```

---

ex.g

*Site 7*

---

**Description**

Example of a concealed trend with quadratic form (Site 7, Jamali et al. 2014)

**Usage**

```
data("ex.g")
```

**Format**

The format is: num [1:25] 0.147 0.153 0.104 0.123 0.15 ...

**Source**

Jamali S, Seaquist J, Eklundh L, Ardö J (2014). Automated mapping of vegetation trends with polynomials using NDVI imagery over the Sahel. *Remote Sensing of Environment*, 141, 79-89. <http://dx.doi.org/10.1016/j.rse.2013.10.019>

**Examples**

```
data(ex.g)
## maybe str(ex.g) ; plot(ex.g) ...
```

---

ex.h

*Site 8*

---

**Description**

Example of a concealed trend with quadratic form (Site 8, Jamali et al. 2014)

**Usage**

```
data("ex.h")
```

**Format**

The format is: num [1:25] 0.813 0.809 0.753 0.792 0.727 ...

**Source**

Jamali S, Seaquist J, Eklundh L, Ardö J (2014). Automated mapping of vegetation trends with polynomials using NDVI imagery over the Sahel. *Remote Sensing of Environment*, 141, 79-89. <http://dx.doi.org/10.1016/j.rse.2013.10.019>

**Examples**

```
data(ex.h)
## maybe str(ex.h) ; plot(ex.h) ...
```

---

ex.k

*Site 9*

---

**Description**

Example of a linear trend (Site 9, Jamali et al. 2014)

**Usage**

```
data("ex.k")
```

**Format**

The format is: num [1:25] 0.382 0.373 0.228 0.385 0.271 ...

**Source**

Jamali S, Seaquist J, Eklundh L, Ardö J (2014). Automated mapping of vegetation trends with polynomials using NDVI imagery over the Sahel. *Remote Sensing of Environment*, 141, 79-89. <http://dx.doi.org/10.1016/j.rse.2013.10.019>

**Examples**

```
data(ex.k)
## maybe str(ex.k) ; plot(ex.k) ...
```

---

ex.m

*Site 10*

---

**Description**

Example of a linear trend (Site 10, Jamali et al. 2014)

**Usage**

```
data("ex.m")
```

**Format**

The format is: num [1:25] 0.781 0.738 0.795 0.871 0.736 ...

**Source**

Jamali S, Seaquist J, Eklundh L, Ardö J (2014). Automated mapping of vegetation trends with polynomials using NDVI imagery over the Sahel. *Remote Sensing of Environment*, 141, 79-89. <http://dx.doi.org/10.1016/j.rse.2013.10.019>

**Examples**

```
data(ex.m)
## maybe str(ex.m) ; plot(ex.m) ...
```

---

 ex.n

*Site 11*


---

**Description**

Example of a no-trend (Site 11, Jamali et al. 2014)

**Usage**

```
data("ex.n")
```

**Format**

The format is: num [1:25] 0.567 0.625 0.61 0.589 0.569 ...

**Source**

Jamali S, Seaquist J, Eklundh L, Ardö J (2014). Automated mapping of vegetation trends with polynomials using NDVI imagery over the Sahel. *Remote Sensing of Environment*, 141, 79-89. <http://dx.doi.org/10.1016/j.rse.2013.10.019>

**Examples**

```
data(ex.n)
## maybe str(ex.n) ; plot(ex.n) ...
```

---

 PolyTrend

*Trend Classification Algorithm*


---

**Description**

PolyTrend classifies the trends into linear, quadratic, cubic, concealed and no-trend types. The "concealed trends" are those trends that possess quadratic or cubic forms, but the net change from the start of the time period to the end of the time period hasn't been significant. The "no-trend" category includes simple linear trends with statistically in-significant slope coefficient.

**Usage**

```
PolyTrend(Y, alpha)
```

**Arguments**

Y	a vector of values corresponding to the trend or de-seasonalised component of vegetation time series data.
alpha	the statistical significance level.



**Details**

An object of the class "PT" is a list including the trend type, slope, direction, and statistical significance.

**Value**

TrendType	the trend type as a number, which can be -1, 0, 1, 2, or 3. The values correspond to a concealed trend (-1), no trend (0), linear trend (1), quadratic trend (2) or cubic trend (3).
Slope	the linear slope value.
Direction	the linear slope direction as a number, which can be 1 or -1. The values correspond to increasing (1) or decreasing direction (-1).
Significance	the slope significance as a number, which can be 1 or -1. The values correspond to statistically significant (1) or statistically in-significant (-1).
PolynomialDegree	the polynomial degree as a number, which can be 0, 1, 2, or 3. The values correspond to no-trend (0), linear (1), quadratic (2), or cubic (3).

**Author(s)**

Sadegh Jamali, Hristo Tomov

**References**

- Jamali S, Seaquist J, Eklundh L, Ardö J (2014). Automated mapping of vegetation trends with polynomials using NDVI imagery over the Sahel. *Remote Sensing of Environment*, 141, 79-89. <http://dx.doi.org/10.1016/j.rse.2013.10.019>
- Tomov H (2016). Automated temporal NDVI analysis over the Middle East for the period 1982 – 2010. <http://lup.lub.lu.se/student-papers/record/8871893>

**Examples**

```
## Following examples are taken from Fig. 3 in Jamali et al. 2014
## Examples of a cubic trend (Site 1 & Site 2)
data(ex.a)
data(ex.b)

pt.a <- PolyTrend(ex.a, 0.05)
plot(pt.a, fig.dates = c(1982:2006))

pt.b <- PolyTrend(ex.b, 0.05)
plot(pt.b, fig.dates = c(1982:2006))

## Examples of a concealed trend with cubic form (Site 3 & Site 4)
data(ex.c)
data(ex.d)

pt.c <- PolyTrend(ex.c, 0.05)
```

```
plot(pt.c, fig.dates = c(1982:2006))

pt.d <- PolyTrend(ex.d, 0.05)
plot(pt.d, fig.dates = c(1982:2006))

## Examples of a quadratic trend (Site 5 & Site 6)
data(ex.e)
data(ex.f)

pt.e <- PolyTrend(ex.e, 0.05)
plot(pt.e, fig.dates = c(1982:2006))

pt.f <- PolyTrend(ex.f, 0.05)
plot(pt.f, fig.dates = c(1982:2006))

## Examples of a concealed trend with quadratic form (Site 7 & Site 8)
data(ex.g)
data(ex.h)

pt.g <- PolyTrend(ex.g, 0.05)
plot(pt.g, fig.dates = c(1982:2006))

pt.h <- PolyTrend(ex.h, 0.05)
plot(pt.h, fig.dates = c(1982:2006))

## Examples of a linear trend (Site 9 & Site 10)
data(ex.k)
data(ex.m)

pt.k <- PolyTrend(ex.k, 0.05)
plot(pt.k, fig.dates = c(1982:2006))

pt.m <- PolyTrend(ex.m, 0.05)
plot(pt.m, fig.dates = c(1982:2006))

## Example of a no-trend (Site 11)
data(ex.n)

pt.n <- PolyTrend(ex.n, 0.05)
plot(pt.n, fig.dates = c(1982:2006))
```

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