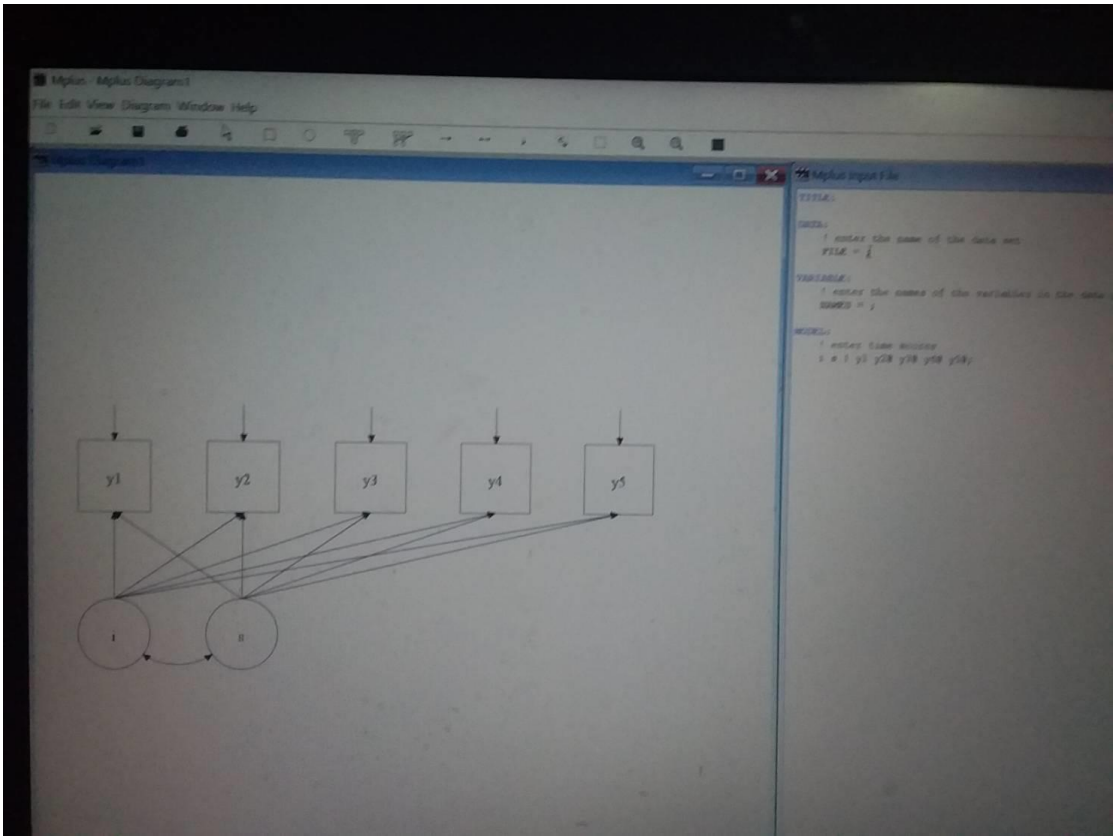
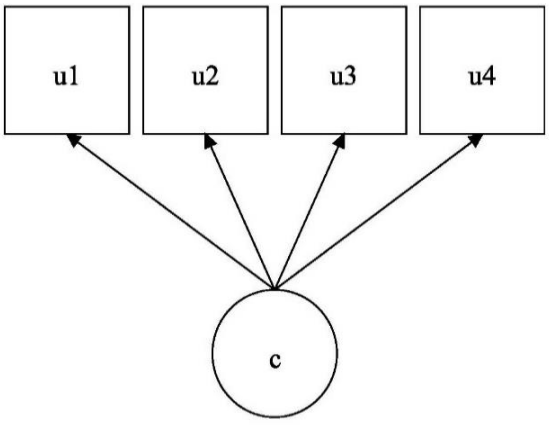
Mplus

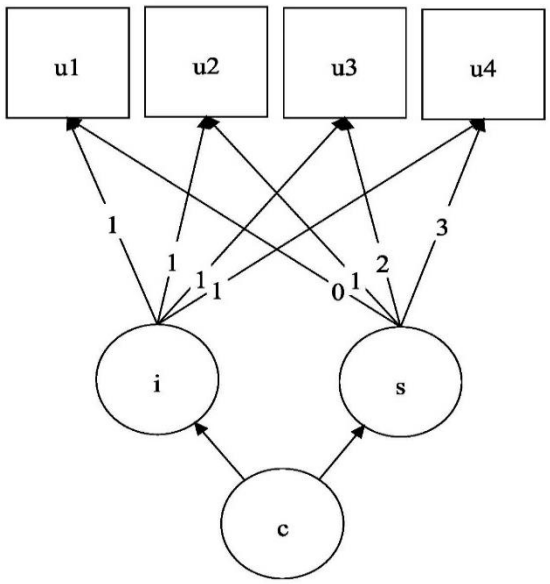


Model 1.1 Latent Class Model (LCM)



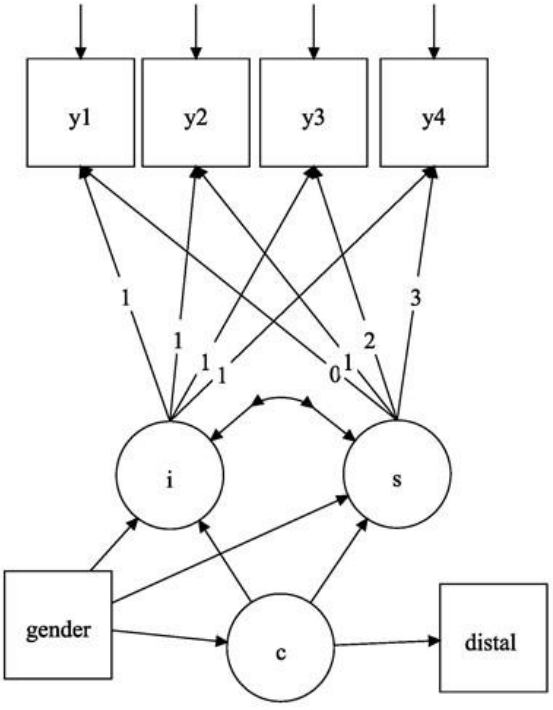
u1-u4: learning outcome (time1-time4)
u: categorical outcome (threshold)
c: latent class (type)

Model 1.2 Latent Class Growth Analysis (LCGA)



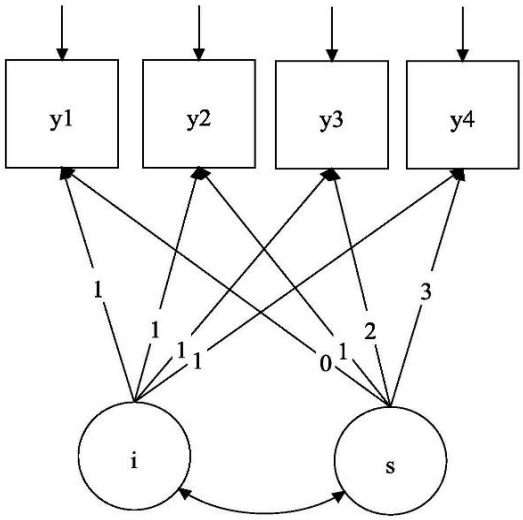
i: intercept (initial status)
s: slopes (growth rate)
u: categorical outcome (logit)
intercept and slope vary across latent class

Model 2 Generalized Growth Mixture Modeling (GGMM)

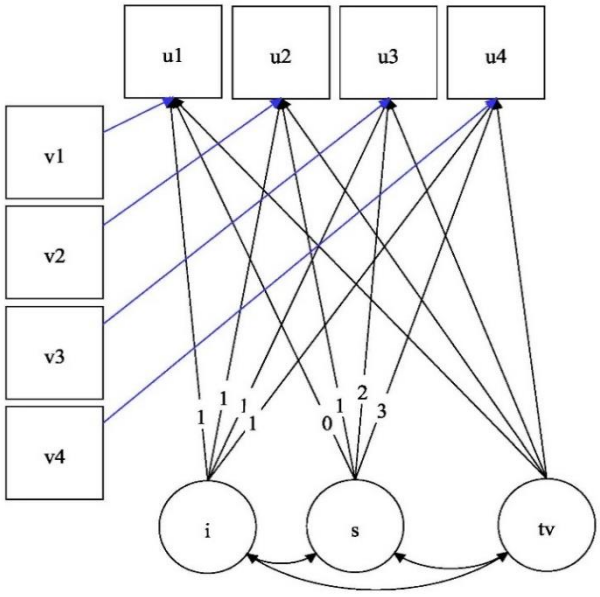


y1-y4: learning outcome (time1-time4)
y: continuous outcome
distal outcome: employment (categorical or continuous)
arrows from gender to c or c to distal (categorical) represent multinomial logistic regression

Model 3.1 Latent Growth Modeling (LGM)

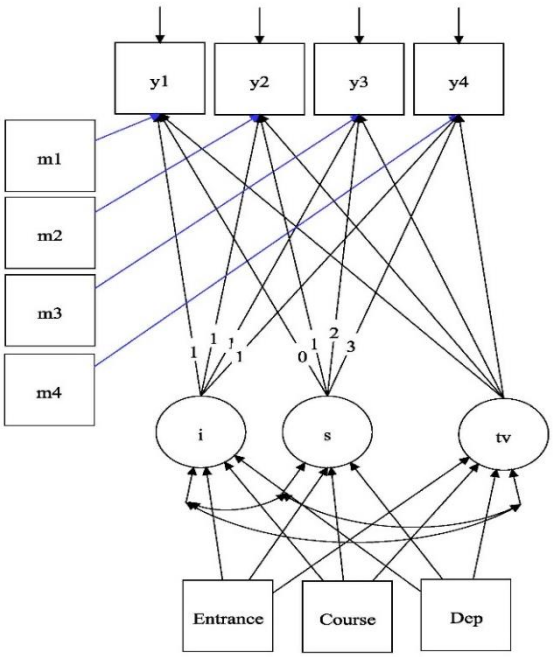


Model 3.2 Latent Growth Modeling (LGM) - Add Time-varying variable



tv: time-varying variable
v1-v4: covariates (time1-time4)
arrows from time-varying latent variable (random) to blue lines represent u1-u4 regress on v1-v4

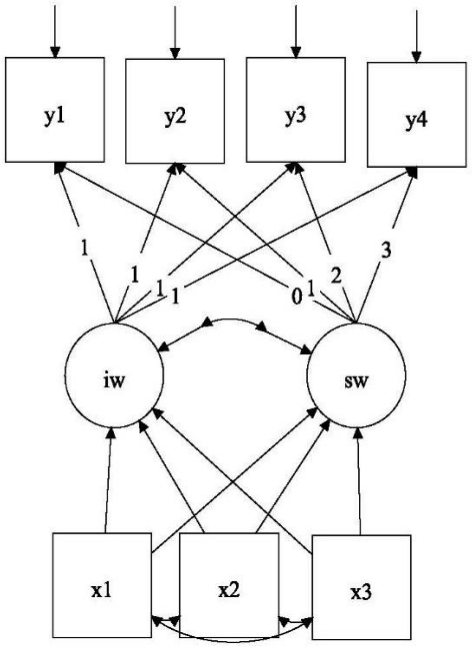
Model 4 Latent Growth Modeling (LGM) - Add Time-varying and covariates



m1-m4: covariates (time1-time4)
all covariates are correlated (default)

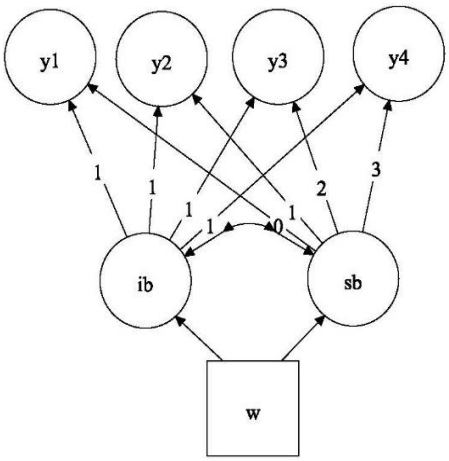
Model 5 Multilevel Growth Modeling (3-level longitudinal data) –

Ex: Random effect



Within (level 1-level 2) Individual

iw= intercepts among individuals in j^{th} school
sw= slopes among individuals in j^{th} school
covariate (x1-x3) = student background in j^{th} school



Between (level 3) Schools

y1-y4~ random effect (clusters or schools)
ib= intercepts among schools (random)
sb= slopes among schools (random)
covariate (w) = public or private

Model 1.1

```
Variable: USEV=u1 u2 u3 u4;
          Categorical=u1-u4;
          Missing= all (999);
          Classes= c (3);
Analysis: Type=Mixture;
Model:
Plot:   Type= Plot 3;
        Series= u1-u4(s);
```

Model 1.2

```
Variable: USEV=u1 u2 u3 u4;
          Categorical=u1-u4;
          Missing= all (999);
          Classes= c (3);
Analysis: Type=Mixture;
Model:
i BY u1-u4@1;
s BY u1@0 u2@1 u3@2 u4@3;
[i@0 s];
Output: TECH11 TECH14;
Plot:   Type= Plot 3;
        Series= u1-u4(s);
```

Model 2

```
Variable: USEV=y1 y2 y3 y4;
          Classes= c (2);
Analysis: Type=Mixture;
Model:
%OVERALL%
```

```
i s | y1@0 y2@1 y3@2 y4@3;
i s on gender;
c on gender;
distal on c;
%C#2%
i s on gender;
i s y1-y4;    ! residual variance
i with s;     ! residual covariance
Output: TECH11 TECH14;
Plot:    Type= Plot 3;
          Series= y1-y4(s);
```

Model 3.1

```
Variable: USEV=y1 y2 y3 y4;
            Missing= all (999);
Analysis:
Model:
i s | y1@0 y2@1 y3@2 y4@3;
i with s;       ! factor covariance
```

Model 3.2

```
Variable: USEV=u1 u2 u3 u4 v1 v2 v3 v4;
            Categorical=u1-u4;
Analysis: Type=Random;
Model:
i s | u1@0 u2@1 u3@2 u4@3;
tv | u1 on v1;
tv | u2 on v2;
tv | u3 on v3;
tv | u4 on v4;
i with s tv;
s with tv;
Output:
```

Model 4

```
Variable: USEV=y1 y2 y3 y4 m1 m2 m3 m4 Entrance Course Dep;
Analysis: Type=Random;
Model:
i s | y1@0 y2@1 y3@2 y4@3;
tv | y1 on m1;
tv | y2 on m2;
tv | y3 on m3;
tv | y4 on m4;
i s tv on Entrance Course Dep;
i with s tv;    ! residual covariance
s with tv;      ! residual covariance    (multivariate normal distribution)
```

Model 5

Random effect:

```
Variable: USEV=y1 y2 y3 y4 x1 x2 x3 w;
          Cluster= schools;
Analysis: Type=Twolevel;
Model:
%WITHIN%
iw sw | y1@0 y2@1 y3@2 y4@3;
iw sw on x1 x2 x3;
iw with sw;
%BETWEEN%
ib sb | y1@0 y2@1 y3@2 y4@3;
ib sb on w;
ib with sb;
```

Latent class:

```
USEV = u11 u12 u13 u14 u21 u22 u23 u24;
Categorical= u11-u24;
Classes = c1(2) c2(2);
Cluster = schools;
Analysis: Type= Twolevel Mixture;

MODEL:
%Within%
%overall%
c1 ON c2;
%Between%
%overall%
c1#1 ON c2#1;    c1#1*1 c2#1*1;

MODEL c1:
%Between%
%c1#1%
[u11$1-u14$1] (1-8);
%c1#2%
[u11$1-u14$1] (9-16);

MODEL c2:
%Between%
%c2#1%
[u21$1-u24$1] (1-8);
%c2#2%
[u21$1-u24$1] (9-16);

Output: TECH1 TECH8;
Plot:    Type= Plot3;    Series= u11-u24(*);
```